

DIVING AMONG SEA KILLERS



# POPULAR MECHANICS

MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

HOOD TRADE MARK, GREAT BRITAIN, N

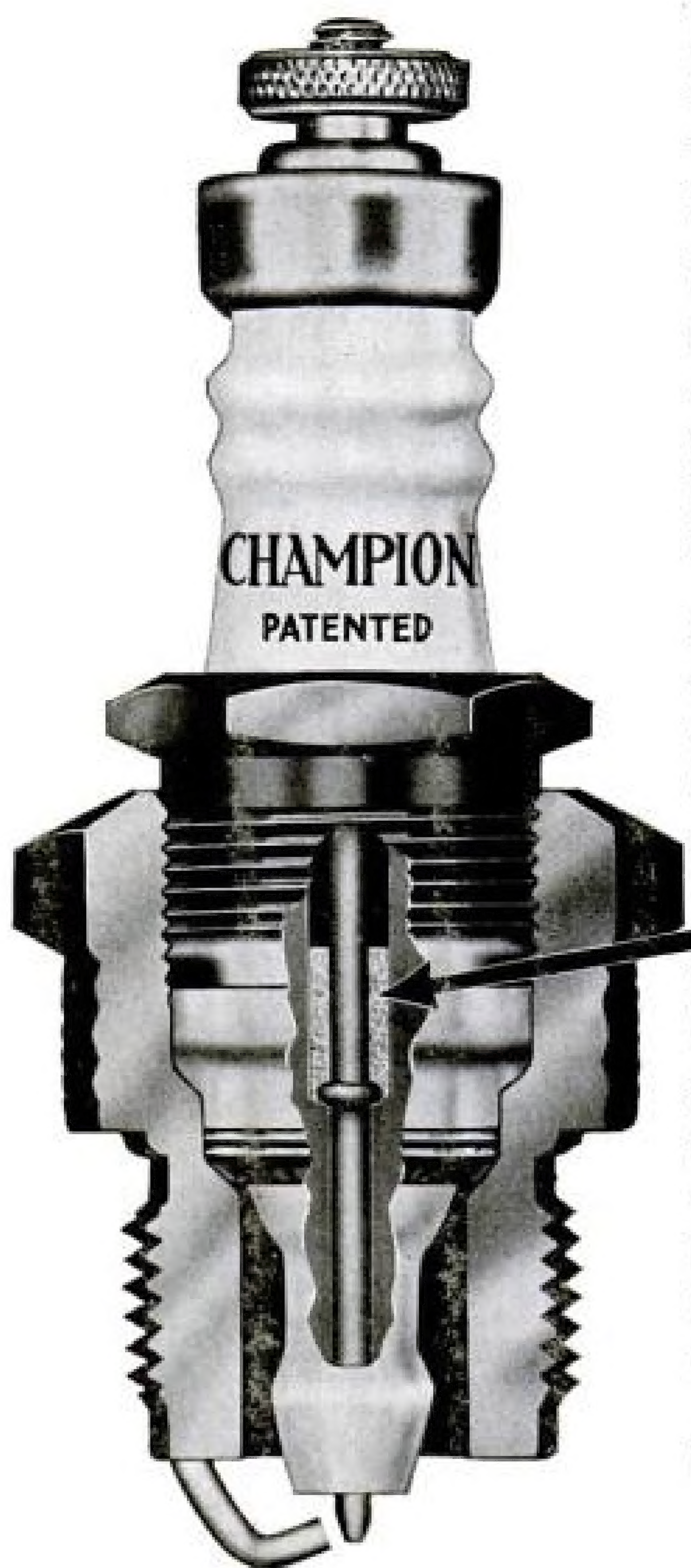
SEE PAGE 506

KING  
OF THE  
MONEY  
DRIVERS

APRIL  
25 CENTS



# SEALING SPARK PLUGS AGAINST LEAKAGE



Because every reader of Popular Mechanics has a far better than average understanding of the function and importance of spark plugs, some of the more recent structural developments in Champion Spark Plugs should prove interesting.

Until very recently all spark plugs, including Champions, used a wet cement to seal the center electrode in the bore of the insulator. Baked, this cement showed a minimum of compression leakage when new—but, as the miles piled up, heat, chemical reaction and mechanical shock all tended to break down the best available cements.

Constant, painstaking research developed better and better cements, but none remained gas-tight until Champion developed a new dry cement, appropriately named Sillment. Obviously a gas-tight spark plug will perform better with no tendency to overheat or pre-ignite.

Sillment, a patented feature of Champion construction, is a dry cement. A very small quantity packed around the center electrode anchors it permanently in place—see illustration—and forms an absolutely gas-tight seal. This raises the efficiency of Champions far beyond that of any other spark plug. This and other patented and exclusive features help Champions to make every engine a better performing engine—proved and re-proved in every major race victory throughout the world in the last twelve years.

USE THE SPARK PLUGS  
CHAMPIONS USE

## CHAMPION EXTRA-RANGE SPARK PLUGS



# All the Comforts of Home!

**IT'S HARD** to realize all that engineers have done to better the ride of modern cars.

Modern weight distribution—which Plymouth pioneered in the low-price field—is only part of it, today.

To balanced weight, this big car adds balanced spring action and a front-end sway eliminator. Big, soft-acting front springs of "Amola" steel have the same "rate" as rear springs.

The seats themselves are of chair height, properly "pitched" to support back and waist, with plenty of room for legs, elbows and shoulders.

The Safety-Steel body is specially insulated against all rumble and noise. Patented "Floating Power" engine mountings eliminate vibration. And, most priceless of all, however, is the *mental* comfort of driving or riding in the world's safest low-priced car



Just a few years ago, not even the costliest car could match the smooth, luxurious riding-comfort that Plymouth passengers enjoy today.

...with 100% hydraulic brakes and a Safety-Steel body.

Your Chrysler, Dodge or De Soto dealer will gladly arrange a Plymouth demonstration at your convenience. Prices are only \$510 and up... list at factory, Detroit (special equipment extra).

PLYMOUTH DIVISION OF CHRYSLER CORP.



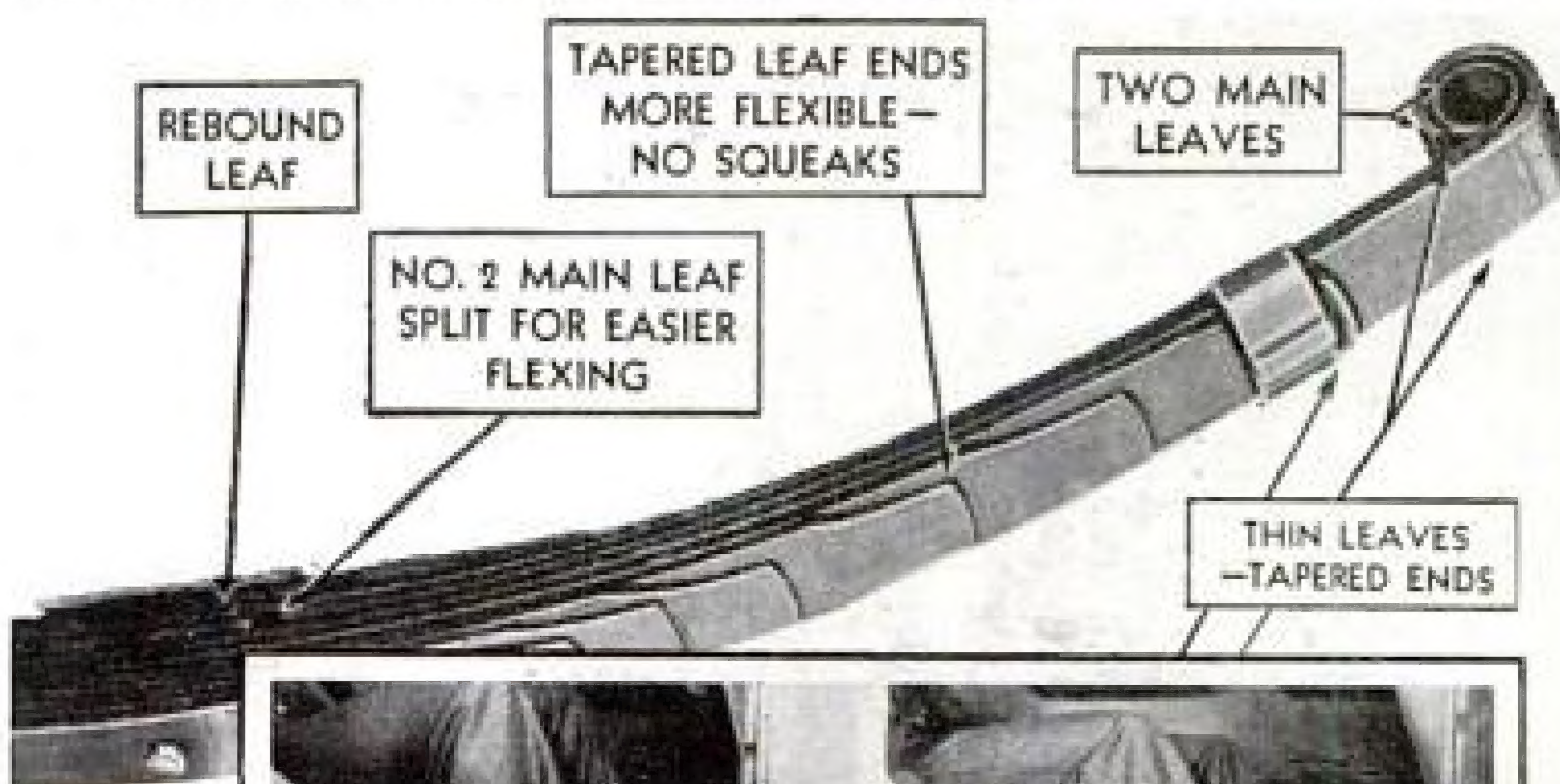
Low center of gravity... unusual head room... "easy-chair" seats.



The old way—unbalanced weight distribution, unbalanced ride.



The Floating Ride—pitching ended. Spring action equalized.



## Insist on the Official Chrysler Motors Commercial Credit Company 6% TIME PAYMENT PLAN

Available through all PLYMOUTH Dealers

You pay for credit accommodation only  $\frac{1}{4}$  of 1% per month on your original unpaid balance. To arrive at your original unpaid balance: 1. Add cost of insurance to cost of car.\* 2. Deduct down payment—cash or trade-in.

RESULT is Original Unpaid Balance.

\*In some states a small legal documentary fee is required.

**PAY \$25 A MONTH—INCLUDING EVERYTHING**



Left—"Low seat-high floor" that cramps legs, knees. Right—Plymouth's lower floor and chair-height seats... a more natural and more comfortable sitting position.

When writing to advertisers please mention Popular Mechanics



# "It's for You"



**W**HO can estimate the value of the telephone in the daily lives of millions of men and women . . . in time and money saved, in increased efficiency, in security and priceless help in time of need!

Contact, communication, swift interchange of ideas—these benefits the modern world offers you. The telephone is one of the chief instruments by which you can seize them. With it at your elbow you are ready for what may come—for opportunity, for emergency, for the brief word that may open a fresh chapter in your life.

**NOW IN EFFECT**—*Special Sunday Rates* for station-to-station Long Distance telephone calls, and *Reduced Person-to-Person Rates* after 7 Every Evening and All Day Sunday. The reductions apply, in general, to calls on which the day station-to-station rate for three minutes is more than 35 cents.



**BELL TELEPHONE SYSTEM**

*When writing to advertisers please mention Popular Mechanics*



# Popular Mechanics Magazine

H. H. WINDSOR, Founder

H. H. WINDSOR, Jr., Editor and Publisher

April, 1936

Vol. 65, No. 4

## Special Features

<u>One-Way Glass</u>	<u>481</u>
<u>From the Rainbow to Concrete - Coloroto</u>	
<u>Who Are the Five Greatest Inventors?</u>	<u>500</u>
<u>Diving Among Sea Killers</u>	<u>508</u>
<u>More Garden in Less Space</u>	<u>516</u>
<u>Mystery Fires and How They Start</u>	<u>520</u>
<u>Masterpieces in Wax</u>	<u>527</u>
<u>The Next War in the Ether</u>	<u>530</u>
<u>How to Win the Soap Box Derby</u>	<u>540</u>
<u>Remaking the World for Movies</u>	<u>546</u>
<u>King of the Money Drivers</u>	<u>554</u>
<u>Shooting in the Dark</u>	<u>562</u>
<u>Electric Organ Has Millions of Tones</u>	<u>569</u>
<u>Factories Built on Table Top</u>	<u>574</u>

(Continued on next page)

## Steel of the Future

MAN progressed from bronze to iron and from iron to steel. Today sees the dawn of a bright new era of steel alloys. There are almost as many kinds of alloys today as there are uses for iron and steel products. Your automobile, for instance, contains about forty different kinds of iron, steel and steel alloys, and those in your car may be unlike the iron and steel products employed for thousands of other purposes. Steel, the master servant of mankind, promises to play an even more important part in the future of civilization than it has in the past. Watch next month for the story of steel alloys, illustrated with eight pages of Coloroto pictures.

## Next Month

YOU can see America today for \$100. In the May issue U. S. Senator Robert R. Reynolds of North Carolina tells you how to do it. In thirty days he visited hundreds of historical spots from the Atlantic to the Pacific and from Canada to Mexico—and made the trip at a total cost of \$100 per person for travel expense.

## Undersea Adventure

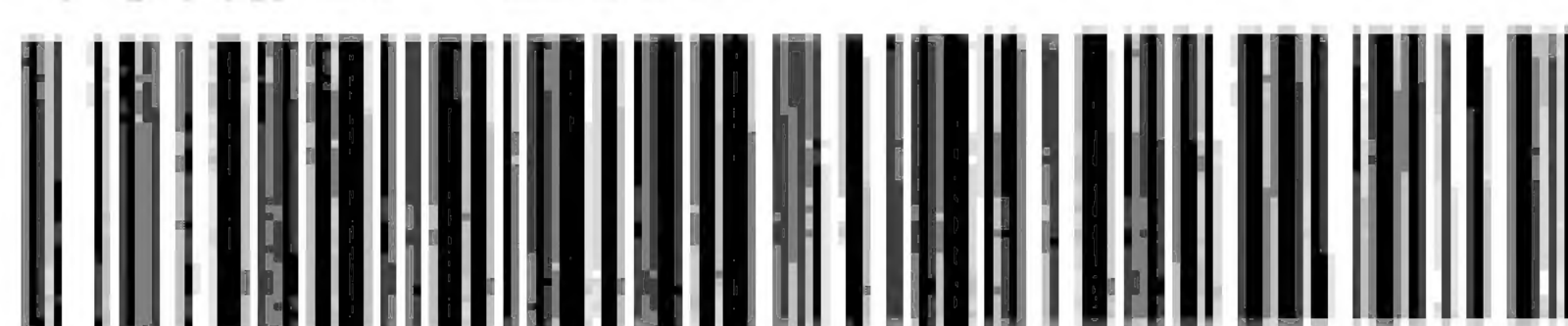
OFF the coast of Mexico under nine fathoms of water lies a chest of gold which went down with a boat in 1868. A party of motion picture technicians, headed by Capt. John D. Craig, set out to find it and to make an undersea movie of its recovery. One day a diver went down on an exploring expedition. He never came back. Weeks later a roll of film found in one of the underseas cameras revealed, like a message from the beyond, the fate of the diver. Read Capt. Craig's thrilling story next month.

## The Age of Power

THE United States, with one-sixteenth of the world's population, today does as much useful work as the other fifteen-sixteenths of the world's people. America's claim as chief worker is due to an abundance of power, and the advance of the power age makes an absorbing article. Read it in the May issue.

Published monthly by POPULAR MECHANICS CO., 200 East Ontario Street, Chicago, U. S. A. Single copy in United States, 25 cents; \$2.50 a year, \$4.00 for two years, \$5.00 for three years in United States and possessions, Canada, Newfoundland, Labrador and countries of the Americas and Spain. To all other countries add \$1.00 a year extra for overseas postage. Changes in address must be reported to us immediately to eliminate delay. Entered as Second Class Matter, Sept. 15, 1903, at the Post Office at Chicago, Illinois, under Act of March 3, 1879. Entered as Second Class Matter at the Post Office Department, Canada. Copyright 1936, by Popular Mechanics Co. in the United States, Australia and France.

This One



G950-3TA-D9QZ

Copyrighted material



# prove this on Your Car!



## Simonizing Makes Dull Cars Look Like New Again



Here's how to do it! First, clean the finish with the improved Simoniz Kleener. It quickly and easily brings back all the beauty your car had when new. Then apply Simoniz. Weather-proof protection that makes the finish last and stay beautiful for years. Try these world-famous products. See for yourself why millions always insist on Simoniz and Simoniz Kleener.

**MOTORISTS WISE**  
**SIMONIZ**

## (Contents—Continued)

### AUTOMOTIVE

Radio brake stops auto at crossings.....	498
Carbon monoxide detector for cars .....	499
Skis on auto's front wheels aid steering in snow....	512
Auto tire "fingerprints" help trace criminals .....	519
Midget car built of junk runs at low cost .....	539
Gasoline made of water gases is almost perfect....	558
Two-pound piston and rod develops more power....	568
Air springs for automobile .....	577

### AVIATION

Coast guard "wings" save lives at sea .....	497
Two radio signals on one frequency .....	505
Flotation gear for airplane .....	506
Plane spans continent at four miles a minute.....	514
Four-motored French seaplane crosses Atlantic....	518
Best gasoline will win next war, says scientist....	524
Boat anchors for clipper ships .....	524
Four-mile-a-minute transport plane .....	539
Around the world on seventeen-day schedule....	544
Cockpit cover converts plane to year-round use....	557
Folding wing plane fits into small garage .....	558
Crash boats aid ocean liners .....	561
Five-mile-a-minute substratosphere plane .....	568
Detachable tail wheel for planes .....	573
Twin windmill blades fly wingless gyro .....	577

### BOATS AND BOATING

Shockproof compass for "Queen Mary" .....	524
Grounded ship stands high and dry .....	559
Wave-rider of inner tubes .....	559

### CONSTRUCTION

Center span of bay bridge hung from cable .....	504
Resilient bracket for highway guard rail .....	504
Model of bridge cables tested with weights .....	519
Boulder Dam cableway carries freight car .....	529
Fireproof wood produced by salt treatment.....	560
Prefabricated hotels for ocean airports .....	134A

### FARM AND GARDEN

Canned fumigant sprays greenhouse under pressure.	505
Cabbage without a smell developed for market....	515
Man-made wind protects orchard from frost.....	550
Airplanes speed evolution of new flowers.....	553

### HOUSEHOLD

Braces for legs of card table .....	529
Pouring spout for metal can .....	551
Soldering outfit makes own gas.....	552
Gas tape kills moths in clothing .....	559
New conveniences for home .....	578, 579

### MODELS

Models of royalty save trips to tailor .....	512
"Mississippi" is navy's only battleship model .....	526
Miniature city controlled by switches .....	565
Big model of Cape Cod canal aids study of tides....	567

### RADIO AND ELECTRICITY

Wind-driven generator with limited output .....	514
Midget two-way set .....	525
One-station radio set is inexpensive .....	526
Controlled radio announces streets in vehicles....	550
Pipeless electric organ plays millions of tones....	569
Electron tube sees through fog and dark .....	572
Adapters for using all-metal tubes .....	581
Inter-room communication system .....	582
Amateur radiophone for 160 meters .....	584
Practical radio suggestions .....	585
B-power unit for mobile radio .....	586
Five-band super of advanced design .....	586
Long life dry A-battery for 2-volt sets.....	586

### SCIENCE AND INDUSTRY

Gold's buying power spurs mining .....	511
Soy bean from plant to automobile parts .....	513
Strange things about the air .....	513

(Continued to page 6A)



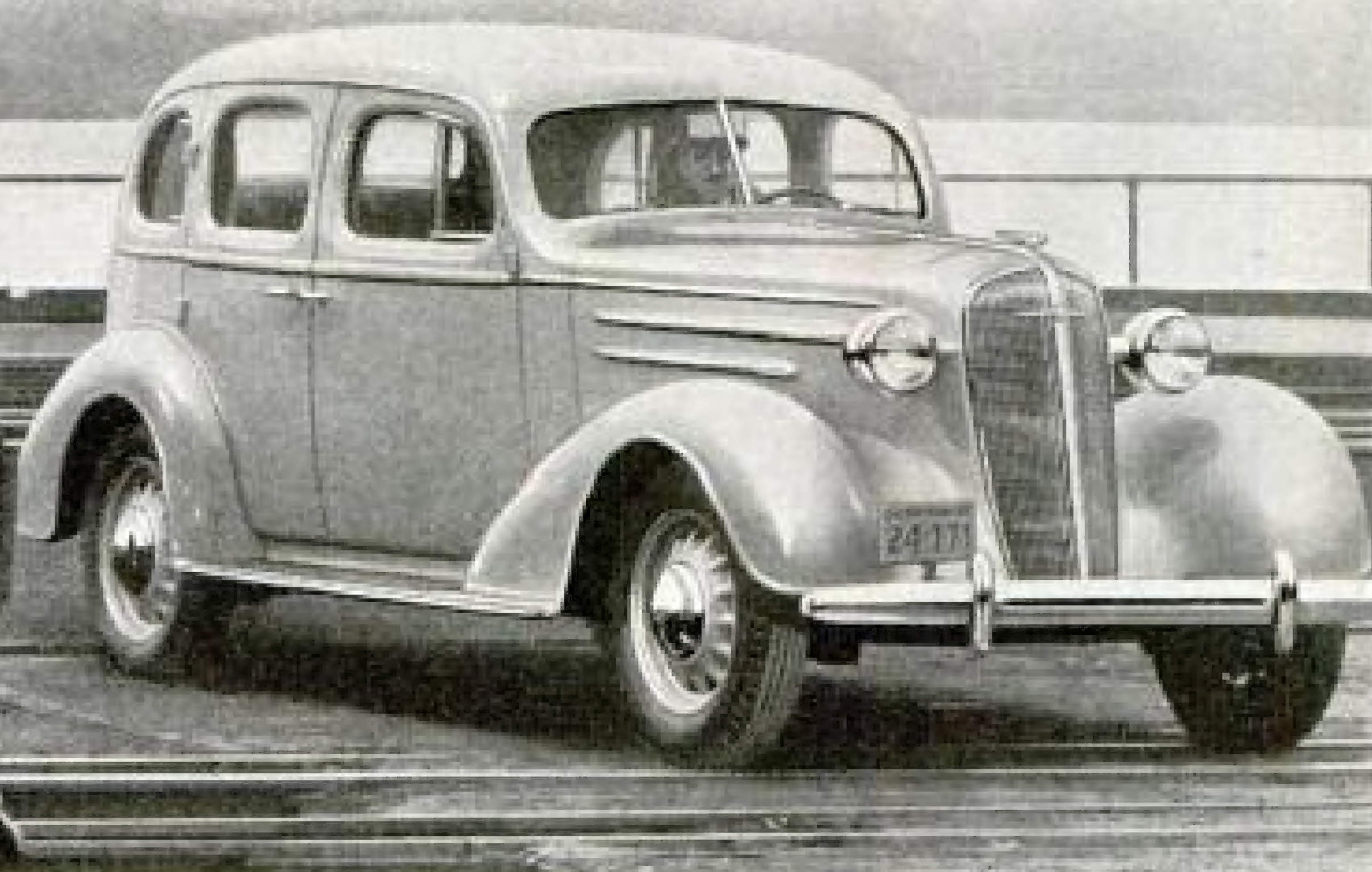
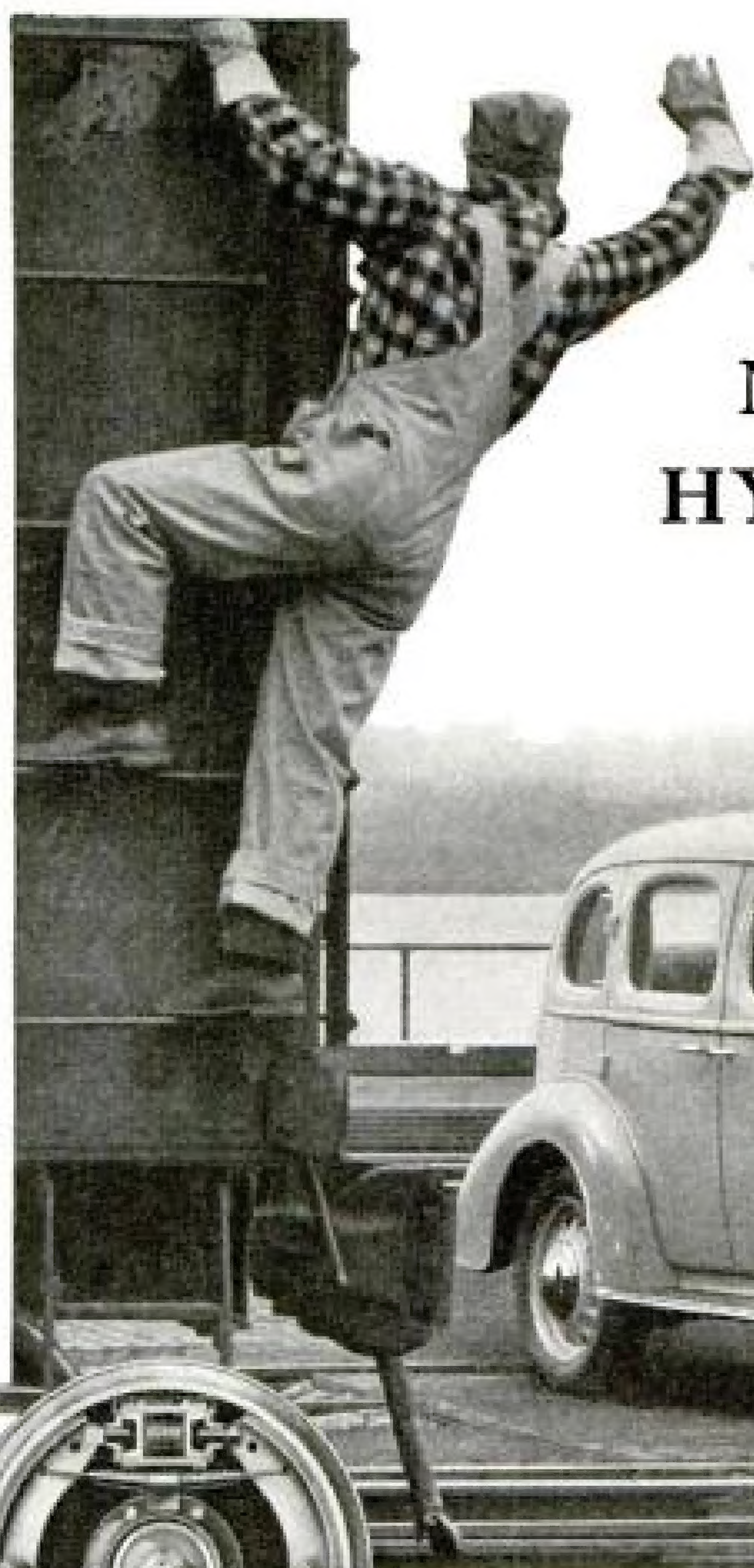
### Lining That Lasts

Chevrolet uses exceptionally fine materials throughout its braking system. Brake linings are tough and long-lasting.



### Doubly Durable Shoes

In each Chevrolet brake, two shoes hinge on double articulated links. This design assures uniform wear with resulting long life.



MASTER DE LUXE SEDAN

## You Need Chevrolet's NEW PERFECTED HYDRAULIC BRAKES for Safe Driving

... and you also need *all* these other vital features exclusive to Chevrolet in its price range

### Swift Action for Safety

The hydraulic pressure which actuates the wheel cylinders of each brake operates according to the fundamental law of physics which states that "pressure exerted upon a column of liquid is expended equally in all directions." Due to the extremely short distances the pedal, fluid and shoes travel, equalized braking is accomplished almost instantaneously upon brake application. A hand brake system, functioning mechanically, operates entirely separate from the hydraulic service brakes and gives the last full measure of safety.



A GENERAL MOTORS VALUE

*Solid Steel one-piece Turret Top Body . . . Improved Gliding Knee-Action Ride\* . . . Genuine Fisher No Draft Ventilation . . . High-Compression Valve-in-Head Engine . . . Shockproof Steering\**

**I**T DOESN'T pay to take chances with your own safety and the safety of your family. Only the absolute limit of motoring protection should satisfy you. And that kind of protection is provided, in the low-price field, only by the 1936 Chevrolet with *New Perfected Hydraulic Brakes*.

These brakes are the *smoothest, surest, safest* brakes ever developed. They give the new 1936 Chevrolet unequaled stopping-power. They respond to almost unbelievably light foot pressure. And, best of all, they are one hundred per cent reliable under all driving conditions.

To the *quick-stop protection* of these new perfected brakes, Chevrolet adds the *all-round protection* of a *Solid Steel one-piece Turret Top*; smooth, steady *Knee-Action Ride\**; *Genuine Fisher No Draft Ventilation*; quick-accelerating *Valve-in-Head Engine*; and *Shockproof Steering\**—all of which are exclusive to Chevrolet in its price range.

Buy one of these new 1936 Chevrolets and you will get the *only complete low-priced car*, as well as the more thoroughly *safe car* which you and your family have every right to demand.

CHEVROLET MOTOR COMPANY, DETROIT, MICHIGAN

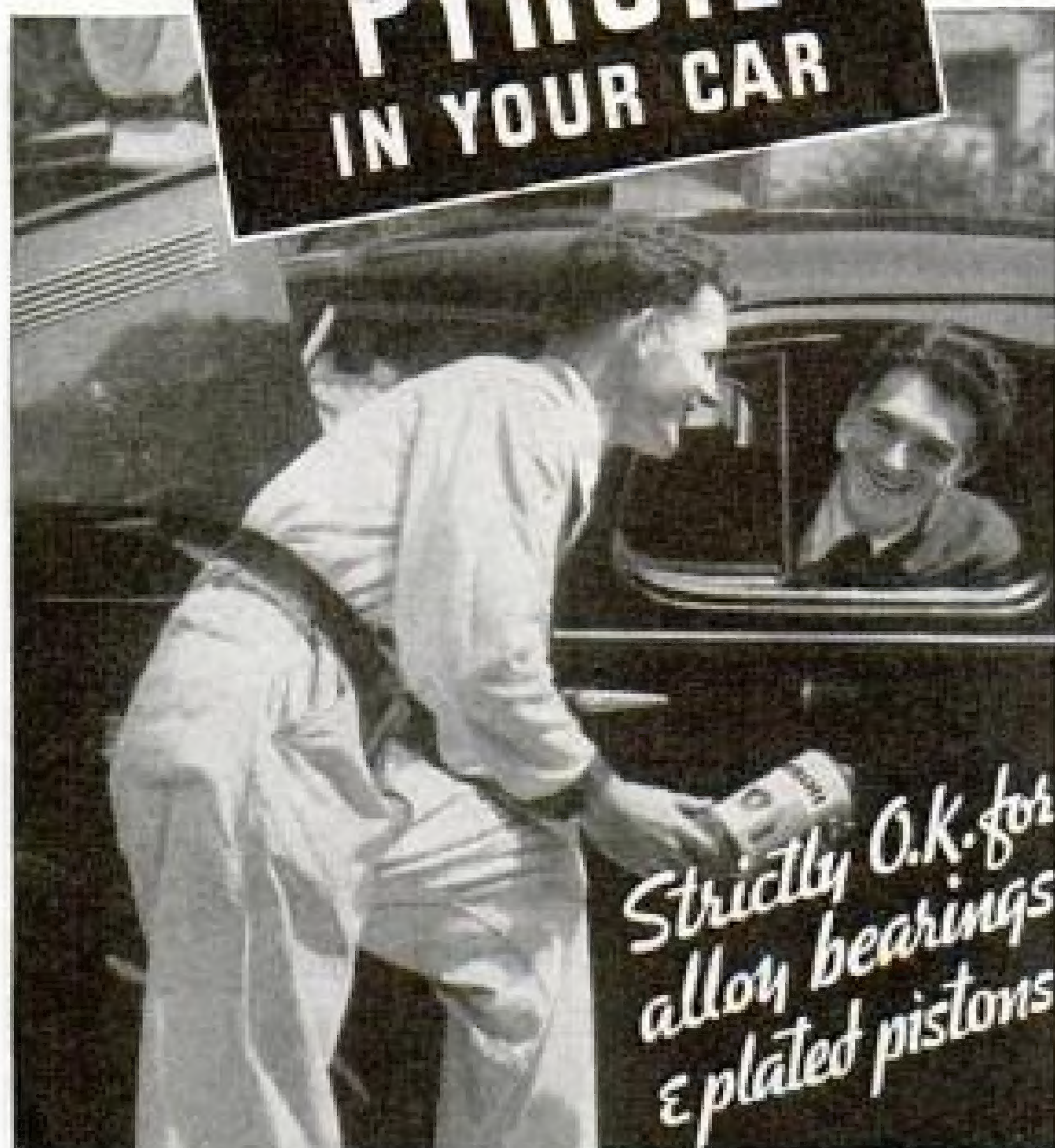
\*Available in Master De Luxe models only. Knee-Action, \$20.00 additional.

# CHEVROLET *The only complete low-priced car*

When writing to advertisers please mention *Popular Mechanics*



*By all means use*  
**GENUINE  
PYROIL  
IN YOUR CAR**



April means a change back to heavier lubricants. By all means, then, ask your service station attendant to **add** the right quantity of Genuine Pyroil to both oil and grease (and to your gasoline). Especially where new cars have alloy metal parts—but in older cars, too. You'll notice improvement in power, speed, general performance. And you'll have **protection** against many common operation hazards.

Pyroil saves far more than its cost. Ask anyone who uses it. Also, mail coupon for interesting facts about this famous Lubrication Process. Manufactured and Guaranteed by Pyroil Co., W. V. Kidder, Founder, 54 Pyroil Bldg., LaCrosse, Wis., U.S.A.

## NOT A MERE "BREAK-IN" OIL

Does not accelerate wear of the metal while "breaking in" new cars. It **PROTECTS** against damage to new parts. By no means an abrasive. Contains no harmful oils, acids, or other harmful ingredients. Keep your new car up to 1936 performance standards. Use Pyroil.

**Pyroil has been tested by Popular Mechanics and is used by Popular Mechanics' Presses and Equipment.**

**DISTRIBUTORS** — For an unusual business opportunity, check coupon below.

Genuine Pyroil (patent protected) Bears This Signature on Every Can.

*W. V. Kidder*  
Founder



PYROIL COMPANY  
54 Pyroil Bldg.  
LaCrosse, Wis., U. S. A.  
Please send Free charts and photomicrographs showing what Pyroil will do for my car.  
☐ Please send details of the Pyroil Sales Opportunity.

Name.....  
Address.....  
City.....County.....State.....

**Simply ADD TO GAS OIL AND GREASE**

## (Contents—Continued)

Milk kept fresh for months by vacuum capping.....	515
Carbon dioxide increases plant growth .....	525
Magnetic detector finds hidden pipes .....	538
Coal mines burned to get gas .....	539
Tiny fire bomb held real peril in next war .....	552
Grinder for big "eye" has human touch .....	566
Meter tells your glove size by measuring hand.....	568
"Earthquake" on shaking table aids study .....	572
New elements created by atom smasher .....	580

### MISCELLANEOUS

Etching on glass with wind-driven sand .....	497
Massive anchors and chair for superliner .....	498
Robot pianist upsets theory that touch controls tone.....	498
Non-slip feet for ladder .....	499
Coach uses diving helmet to watch swimmers.....	504
German musician invents instrument for home.....	504
Prism spectacles for reading in bed .....	505
Fountain brush for typewriter .....	507
Warship's "voice" and "ears" aid battle practice.....	507
Cymbal maker uses secrets centuries old.....	511
Music changes color lighting on "Queen Mary".....	512
Moon clock shows phase for next night .....	515
Eskimo sledges lashed with walrus thongs .....	518
Circulation in feet stimulated by rough cylinders.....	519
Collar keeps dog from biting tail .....	525
Ten-car "Zephyrs" speed Denver-Chicago schedules.....	538
Back-yard game gives thrills of polo and golf.....	544
Tower cools swimming pool water .....	545
Windproof cigarette lighter .....	545
Woodworking unit has many tools .....	545
Lofty Texas memorial to have fast elevators.....	550
Streamline locomotive hauls Japanese express.....	551
Whale's big molars replaced for San Diego fair.....	551
Race horses wear "tailored" shoes .....	552
Jointer has safety guard .....	553
Wave patterns help musician .....	557
Runner adapts wheelbarrow to snow .....	558
Open boats used for whaling .....	560
Safety light for police horse .....	560
Photos printed in colors .....	561
Super-liner planned for fast ocean service .....	566
Brakes for roller skates .....	567
Globe clock shows time around world.....	571
Nine-lens aerial camera .....	571
Granite cross cut from one piece .....	573
Whales tagged to study migration .....	573
Flat chest and intelligence go together .....	577
Language-teaching machine .....	580
Two standard time zones proposed for U. S. A.....	580

## Craftsman and Shop Notes

### AUTOMOTIVE

Family trailer—Part III .....	604
Truck has folding sideboards for bulky loads.....	635
Removable luggage rack of sheet metal .....	637
Stone dents in fenders prevented with roofing strips.....	637
Carpet removes snow in front of garage .....	638
Electric drill is husky and portable .....	638
Fuel-pump diaphragm from photo film .....	638
Name center-punched on tools .....	638
Bending small tubing .....	639
Fender tools from bearings .....	639
Wedge to lubricate auto springs .....	639

### FARM

Seeds tested in raw potato .....	592
Sheathing bridle bit in winter .....	623
Sheaf-string cutter on pitchfork .....	624
Cheap smudging equipment for orchards .....	627
Old cans fitted with carrying handles .....	636

### FURNITURE

Coffee table and tray .....	587
Colonial cupboard to store linen and silverware.....	590
Carvings imitated with seeds .....	593

(Continued to page 8A)



# When jobs are looking for men —that's news!



## ..... NOW IS THE TIME! .....

**R**IGHT now, in many lines there is a search for really good men—managers, leaders—men who can take charge of departments, businesses, branch offices, and set things humming.

As always, there are not enough ordinary jobs to go 'round—but rarely before in the history of American business, has there been so much room at the top! New jobs are being created by the business pick-up in almost all lines.

Ordinarily, there would be plenty of men to fill these jobs—men in junior positions who have been studying in spare time. But most men have been letting their training slide during these dark years of depression . . . "What's the use?"—You have heard them say. Perhaps there has been some excuse for sticking to any old kind of a job one could get the past few years—but the door is wide open for the man with ambition **NOW!**

And don't let anyone tell you that "Opportunity Only Knocks Once"—that's one of the most untruthful sayings

ever circulated. Opportunities flourish for *every* American every day of his life.

Far more to the point is to be ready—be *prepared*—to make yourself *interesting* to the big-time employer—and LaSalle offers you a short-cut method of qualifying for opportunity jobs in accounting, law, traffic, executive management, and kindred occupations.

LaSalle Extension University is 27 years old—40,000 students enroll annually—60 American firms each employ 500 or more LaSalle-trained men—surveys show that LaSalle students attain 40% average salary increase after graduation—10% of all C. P. A's in the U. S. A. are LaSalle-trained—in two states over 60% of the C. P. A's are LaSalle-trained men.

Why not find out what LaSalle has done and is doing for men in *your* position? Send and get the facts; see what LaSalle can do for you, personally!

There's no question about it—business is picking up—jobs are looking for *trained men*—the time has come for you to *qualify* for prosperity. Mail this coupon today!

LaSalle Extension University, Dept. 464-R, Chicago.

Kindly send me your free booklet on the business field I have checked—and tell me how your training in that field can help me.

☐ Business Management ☐ Business Correspondence ☐ Salesmanship ☐ Law ☐ Commercial Law  
☐ Business English ☐ Traffic Management ☐ Accountancy ☐ Bookkeeping

Name.....Position.....

Address.....

# LASALLE EXTENSION UNIVERSITY

When writing to advertisers please mention Popular Mechanics






*... it's a sure way  
to tell a lamp that...*

**STAYS BRIGHTER  
LONGER!**

**GENERAL  ELECTRIC  
MAZDA LAMPS**

Also the famous G-E "Dime" lamp. The first real value in a 10c lamp. Available in 60, 30, 15 and 7½ watt sizes and is marked like this 

## (Contents—Continued)

### HAND TOOLS

Shield for tinner's shears .....	592
Small hand vise swivels to any angle .....	602
Scraper has interchangeable blades .....	620
Measuring tapered work with micrometer .....	624
Soldering iron has elbows for different angles.....	626
Avoiding rust spots on slide rule .....	636
Burring end of screwdriver to make it hold .....	636
Drill chips kept out of work with air .....	640

### HOME IMPROVEMENTS

Poultry wire keeps snow from sliding off roof.....	592
Window awnings of metal .....	602
Footings protect basement partitions .....	603

### HOUSEHOLD

Cutter for adhesive tape .....	589
Sliding bar for kitchen utensils.....	589
Lines on gas cocks tell when stove is shut off .....	592
Protecting contents of crowded refrigerator .....	593
Pie marker assures uniform pieces .....	599
Keeping cut flowers in wood vases .....	610
Wheeled ash can is easy to move .....	610
Shoe-shining stand has plenty of storage space.....	611
Holder for small mirror made from coat hanger.....	618
Tool for removing sink strainers .....	623
Saw handle on bread knife easy on wrist .....	624

### MACHINE TOOLS

Machining rods on grinding wheels .....	600
Flexible belt sander .....	621
Washer on oilcan lifts oiler caps .....	626
Tool guide for profile shaping .....	634

### PHOTOGRAPHY

Improved focusing cloth .....	608
Printing frame adapted to handle small negatives..	610
Ferrotypes plates renewed with auto polish .....	618
Tilting lens board for camera .....	625
Photographing dark and light objects .....	626

### STORE AND SHOP

Small parts kit made from egg-case separator.....	626
Window display has moving background .....	627
Blueprint-paper box has a cutter .....	635
Cleaning rubber stamps with bottle brush .....	636
Measuring diameter of a ball.....	636
Mixture for casting crucibles .....	636

### MISCELLANEOUS

Keyless lock foils intruders .....	589
Squirt bottle made from collapsible tube .....	589
Eraser on lead end of pencil for quick corrections..	592
"Arrowhead" sloop, fast, trim and able—Part I....	594
Practicing table tennis alone .....	600
Sanding irregular lathe turnings .....	600
Tool for setting out plants .....	600
Merry-go-round is hand propelled .....	601
Mittens pinned to coat for extra pockets .....	602
Felt-lined case for guns .....	603
Clamp to hold boat and trailer .....	609
Springless gate closer .....	609
Mitten blotter saves time .....	610
Miter box has clamp to hold work rigidly .....	611
Model railway building .....	612
Feeding pen in aquarium protects pets .....	618
Repairing threads on fountain pens .....	618
Sidecar for your bicycle .....	619
Ideas that help the pressman .....	623
Finger pencil aids clerk .....	624
Screw slots altered to prevent theft .....	625
Adjustable shelf on ladder holds tools .....	626
Sandbag brake checks speed of boxes on chute....	627
Designing and building thermostats .....	628
Hand truck has brake to load heavy objects .....	634
Removing grippers from printing press quickly....	634
Ham supported vertically for easy slicing .....	640

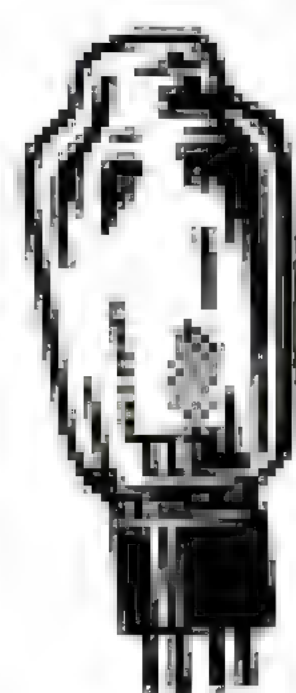




## MECHANICAL ENGINEERING

### — A FIELD WITH A FUTURE

This course has meant advancement to hundreds of ambitious men, mechanics, draftsmen, blacksmiths, foundrymen, patternmakers, apprentices, and mechanical engineers — men who wanted to get ahead and to earn more money. You, too, will find that enrolling for an I. C. S. Course is a real investment.



## RADIO holds great rewards for trained men

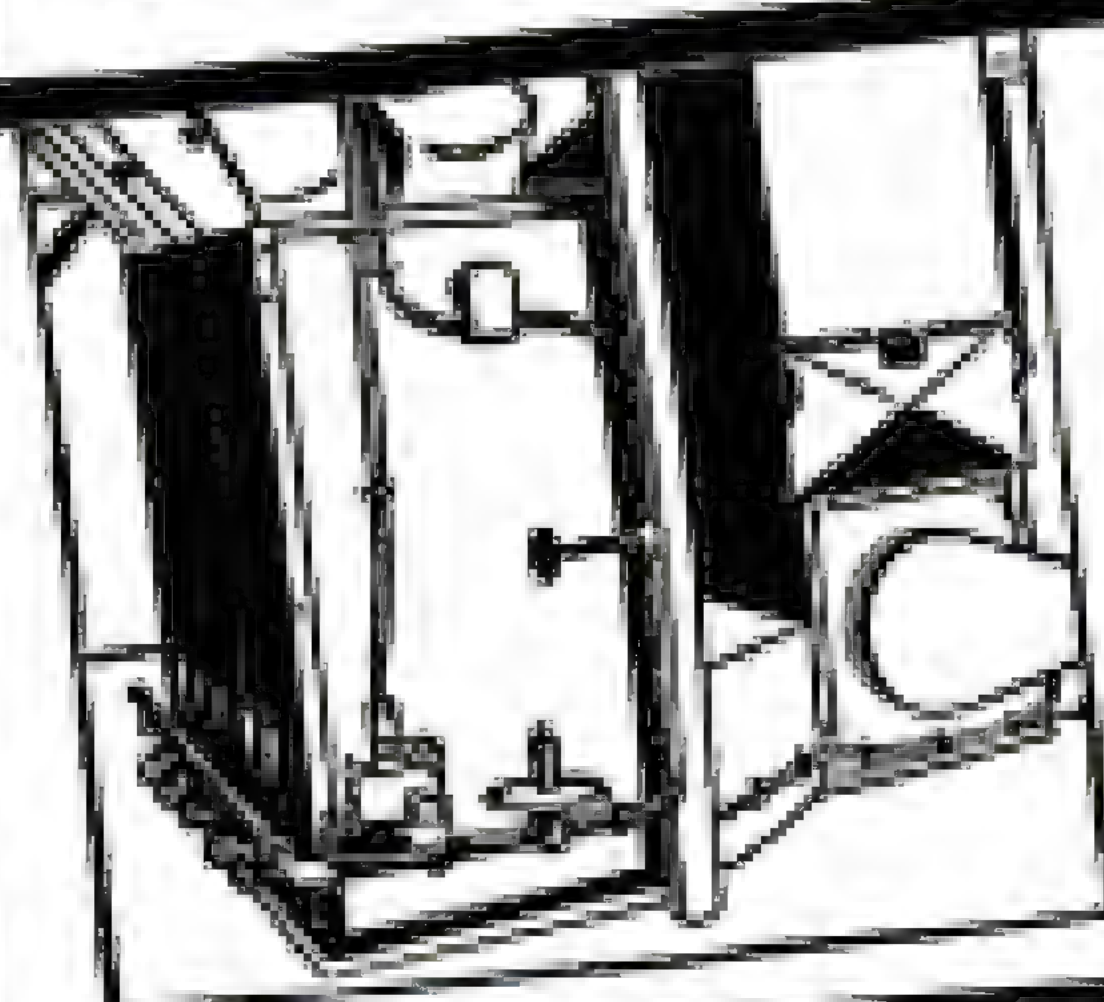
Almost in a decade radio has become a giant industry. The opportunities created will be enjoyed by trained men. The I. C. S. Radio Course, prepared by leading authorities, will help make you a trained man! A fascinating book — FREE.



## DIESEL POWER

### A COMING AMERICAN INDUSTRY

The internal-combustion engine represents man's supreme triumph of machine power. Diesel engines are in great demand. Many are acquiring necessary knowledge through spare-time study of this modern I. C. S. Course on Diesel engines. Send for free booklet!



## AIR CONDITIONING

### THE NEXT BIG INDUSTRY

Plumbing and heating engineers must know Air Conditioning — the field in its broader aspects invites ambitious men. Write for information on the new Air Conditioning Course offered by the International Correspondence Schools.

## ADVERTISING

Would you like to become an advertising man? Would you like to know if you possess the necessary qualifications? Then here's your chance! Send the coupon — today!

## INTERNATIONAL CORRESPONDENCE SCHOOLS

BOX 5614-H, SCRANTON, PENNA.

★ Without cost or obligation, please send me a copy of your booklet, "Who Wins and Why," ★ and full particulars about the subject *before* which I have marked X:

☐ MECHANICAL ENGINEERING

☐ RADIO

☐ DIESEL POWER

☐ AIR CONDITIONING

☐ ADVERTISING

### TECHNICAL AND INDUSTRIAL COURSES

- ☐ Structural Draftsman
- ☐ Structural Engineer
- ☐ How to Invent and Patent
- ☐ Electrical Engineer
- ☐ Electric Lighting
- ☐ Welding, Electric and Gas
- ☐ Reading Shop Blueprints
- ☐ Boilermaker

- ☐ Mechanical Draftsman
- ☐ Machinist
- ☐ Toolmaker
- ☐ Patternmaker
- ☐ Gas Engines
- ☐ Aviation Engines
- ☐ Automobile Mechanic
- ☐ Refrigeration

- ☐ Steam Electric Engineer
- ☐ Marine Engineer
- ☐ R. R. Locomotives
- ☐ R. R. Section Foreman
- ☐ Air Brakes
- ☐ R. R. Signalmen
- ☐ Highway Engineering
- ☐ Civil Engineering

- ☐ Surveying and Mapping
- ☐ Coal Mining ☐ Mine Foreman
- ☐ Navigation
- ☐ Cotton Manufacturing
- ☐ Woolen Manufacturing
- ☐ Agriculture
- ☐ Fruit Growing
- ☐ Poultry Farming

### BUSINESS TRAINING COURSES

- ☐ Business Management
- ☐ Office Management
- ☐ Industrial Management
- ☐ Traffic Management
- ☐ Accountancy
- ☐ Cost Accountant

- ☐ C. P. Accountant
- ☐ Bookkeeping
- ☐ Secretarial Work
- ☐ Spanish
- ☐ French
- ☐ Salesmanship

- ☐ Service Station Salesmanship
- ☐ First Year College
- ☐ Business Correspondence
- ☐ Lettering Show Cards ☐ Signs
- ☐ Stenography and Typing
- ☐ Civil Service ☐ Mail Carrier

- ☐ Railway Mail Clerk
- ☐ Grade School Subjects
- ☐ High School Subjects
- ☐ College Preparatory
- ☐ Illustrating
- ☐ Cartooning

Name.....Age.....Address.....

City.....State.....Present Position.....

If you reside in Canada, send this coupon to the International Correspondence Schools Canadian, Limited, Montreal, Canada

When writing to advertisers please mention Popular Mechanics



# The Diesel Engineer



## Diesel—The Newest, Fastest-Growing Power

Diesel engines—because of their high efficiency, dependability, and economy of operation—are fast replacing steam and gasoline engines in power plants, motor trucks and busses, locomotives and ships, aircraft, tractors, dredges, drills, pumps, etc.—opening up an increasing number of well-paid jobs for Diesel-trained men. The field of Diesel Engineering is on the upgrade and continually expanding. It will provide steady employment and advancement for those properly trained in this new industry—as long as they need to work.

You get complete information on all the latest Diesel developments—two- and four-stroke cycles; low- and high-speed and heavy-duty types; Diesel-electric generating systems, etc.—in our course. Includes all text material—with special diagrams for quick understanding of this new power.

**American School, Dept. D-445, Drexel Avenue at 58th Street, Chicago, Illinois**

Now is your chance to get into a big new industry and grow up with it to an important position. Today there is practically no competition in the Diesel field, but the increasing use of Diesel engines will result in keen competition for jobs in the near future. By starting your training now, you can keep ahead of such competition.

### What This New Field Offers You

Get our Free Diesel Booklet and learn all about this newest, fastest-growing line—its opportunities and requirements. Find out what the Diesel field offers you—how rapidly the Diesel industry has developed during the last three years—the large number of Diesel engines and accessories being manufactured today—how quickly you can obtain a complete understanding of Diesel engine principles and operation by home study during your spare time—without interfering with your regular work.

Asking for information involves no obligation—but it may mark the turning point in your life. Write TODAY for full information.

**Turn Your Spare Time into Dollars**

## DON'T BUY

Mandolin  
Guitar  
Banjo or  
Drums



Don't buy Guitar, Mandolin, Banjo, or Drums, until you have tried the Slingerland May-Bells. Guaranteed More for your Money. Wonderful, snappy, powerful, pleasing tone. No equal in price. Sold on easy payments and 5 days free trial by all leading music dealers.

Send for free catalog. Mention instrument wanted and nearest music dealer.

**Write today:**

**Slingerland Musical Instrument Mfg. Co.,  
1325 Belden Ave., Chicago, Ill.**

Cut This Adv.  
Out — Good  
for \$1.00  
Credit

## RADIO ENGINEERING

RCA Institutes offers an intensive course of high standard embracing all phases of Radio. Practical training with modern equipment at New York and Chicago schools. Also specialized courses and Home Study Courses under "No obligation" plan. Illustrated Catalog on request.



**RCA INSTITUTES, Inc.** Dept. PC-36

75 Varick Street, New York, N. Y.  
1154 Merchandise Mart, Chicago

Recognized Standard in Radio Instruction Since 1909



## VOICE

### 100% Improvement Guaranteed

We build, strengthen the vocal organs—not with singing lessons—but by fundamentally sound and scientifically correct silent exercises... and absolutely guarantee to improve any singing or speaking voice at least 100%... Write for wonderful voice book—sent free. Learn WHY you can now have the voice you want. No literature sent to anyone under 17 years unless signed by parent.

**PERFECT VOICE INSTITUTE, Studio 13-54  
64 E. Lake St., Chicago**



*Learn to Write*

Begin Today. Write for my Free Book, "How to Become a Good Penman." It contains specimens and tells how others learned to write in spare time. Your name elegantly written on a card if you enclose stamp for postage. Write today. F. W. TAMBLYN, 418 Ridge Bldg., Kansas City, Mo.

## AUTO-MECHANICS & WELDERS

Auto Mechanics and Welders are in big demand. Complete courses in arc and acetylene welding, body and fender bumping, spray painting and metal finishing. Pay while you learn. Enroll now at special low rates. Write today. **MICHIGAN TRADE SCHOOL** 3758 Woodward Ave., Detroit, Mich.

Write  
for  
**FREE  
CIRCULAR**

When writing to advertisers please mention Popular Mechanics



# Learn to Earn \$30, \$40, \$50, and Up a Week in ELECTRICITY

On Jobs Like These — No Correspondence  
Real Work on Modern Electrical Equipment

**WHETHER** you are 16 or 40 years of age, Electricity offers you a real future. . . . Don't waste your best years in a low pay untrained job, or worse yet, never sure of even a poor paid job. Get into a real live, money making field where thousands of men make \$30, \$40, \$50 and up a week in the fascinating field of Electricity. Prepare today for a good job in a field that's full of opportunities for trained men.

## Learn by Doing . . . in 12 Weeks in the Big Chicago Coyne Shops

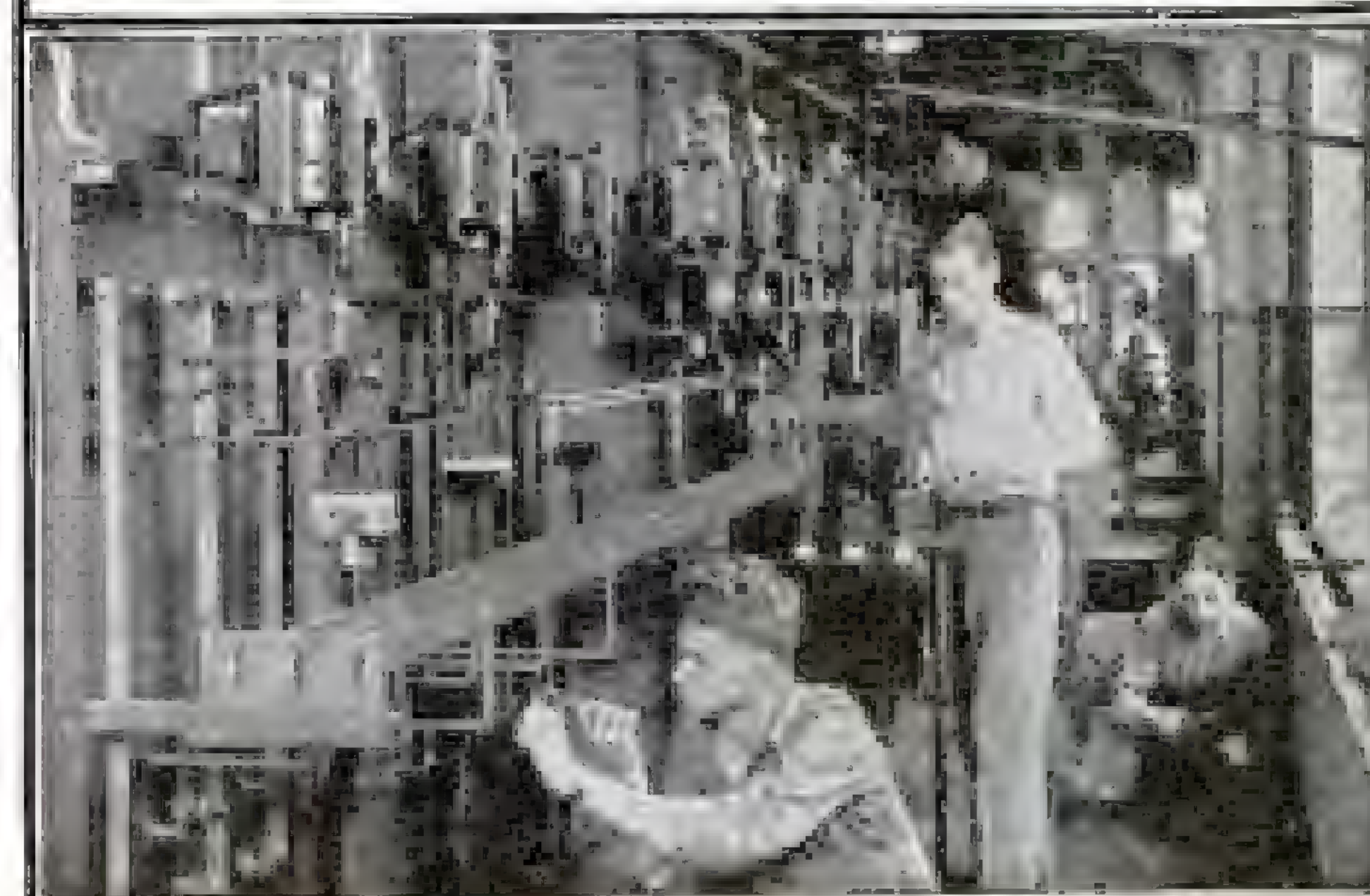
The remarkable "Learn by Doing" method used in the great Coyne Shops trains you to master Electricity and its many branches in 12 weeks. Actual shop work—not a correspondence course—you don't have to recite. You are trained by actual work in modern daylight shops on the finest kind of Electrical equipment, under personal supervision of expert instructors. That's why Coyne Training prepares you as a real Practical Electrician in such a short time.

## You Don't Need Previous Experience or a Lot of Book Learning

Many of our successful graduates have not even completed common school. At Coyne you learn by actual experience on a wide variety of up-to-date generators, motors, dynamos, batteries, automotive and aviation engines, electric signs, etc. Do the actual jobs you will be called on to do out in the field. When you finish Coyne Training you can confidently tackle any job, for you will have actually had similar work during your training.



Working on Real Electrical Equipment at Coyne



A Real Switchboard in the Coyne Shops

**Astounding!  
Offer!**

**18 MONTHS TO PAY** FOR YOUR TRAINING  
in Small Monthly Payments after you graduate!



**DIESEL ENGINES,  
REFRIGERATION,  
AIR CONDITIONING.**

### INCLUDED WITHOUT EXTRA COST

The fastest growing industries in America today. Manufacturers and Distributors of Refrigeration and Air Conditioning equipment need Trained men who have Specialized in these rapidly expanding fields. Here at Coyne you will prepare to fill a job as Installation and Service man, Shop Mechanic, Tester, Assembler, Inspector, etc. You will learn about various types of compressors, condensers, temperature control devices, thermostatic and expansion valves—you will do actual work on latest types of Refrigerating and Air Conditioning machines. And, it won't cost you one extra cent to get this remarkable training. I include it absolutely Free with your regular Electrical Training.

Get your training first—then pay back tuition in easy monthly payments starting 5 months from the date you start school, or 2 months after the required 12-weeks training period is over. And you'll have 18 months to complete your payments. Mail the coupon now and I will send you, without obligation, full details of this astounding offer!

### Earn Living Expenses While You're Training

Many of my students work part time to help pay their living expenses while they are training. If you need this work we will do our best to get it for you. Send coupon for details.

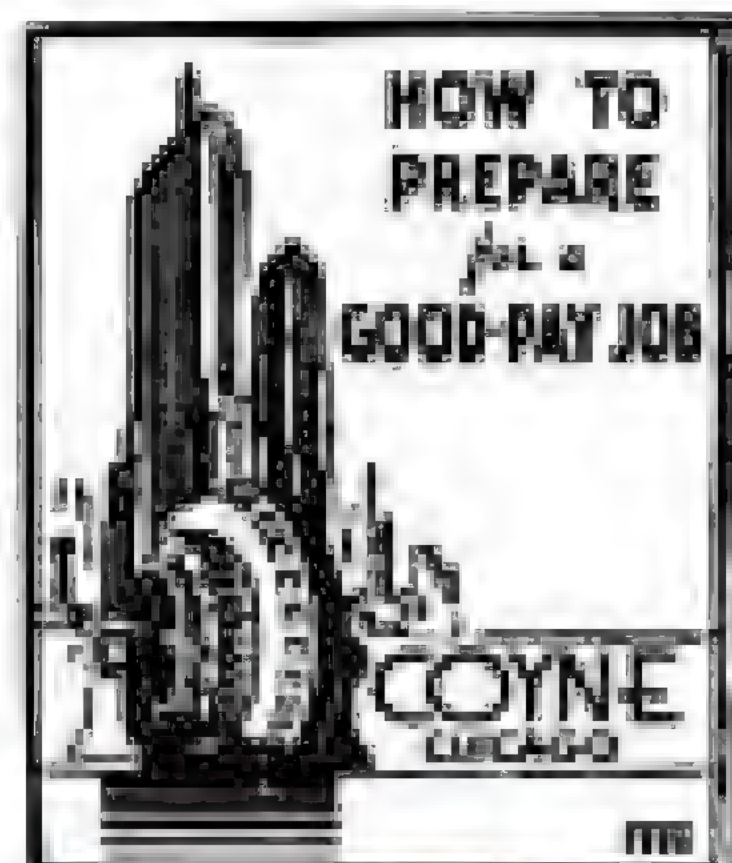
### Employment Help For You After Graduation

My Graduate Employment Service will give you real employment help. As one of my graduates you will get assistance quickly, and every help we can give you to locate a job for which you have been trained.

**MAIL COUPON NOW**

### GET MY FREE BOOK

Get the new "Coyne Opportunity Book," giving all facts about Coyne Training. Photographs of Shops showing students at work on modern electric equipment under the personal supervision of Coyne Expert Instructors. Also details of my Spare Time Employment Offer, Pay After Graduation Plan and Graduate Employment Service. Yours without cost. Simply Mail the coupon.



**H. C. Lewis, President  
Coyne Electrical School  
500 S. Paulina St., Dept. 46-72  
Chicago, Ill.**

Send me your big FREE Book about Coyne Training and give me all details regarding your "Spare Time Employment Offer" and "Pay-Tuition-After-Graduation" Plan of easy, monthly payments.

Name.....

Address.....

City.....State.....

Mail in envelope or paste on postcard.

**COYNE** H. C. LEWIS, Pres. Founded 1899  
**ELECTRICAL SCHOOL**  
500 S. Paulina St., Dept. 46-72, Chicago, Ill.

When writing to advertisers please mention Popular Mechanics



Okmulgee, Okla. Des Moines, Iowa  
Hazelton, Pa. Sioux City, Iowa

# Look Men!

Here's a Partial List of States, Cities and Institutions in which **GRADUATES** of I. A. S. were placed in positions as **Finger Print Experts!**

**Be A Secret Service and Identification Expert!**

State of Wash. Calgary, Alta., Can.  
State of Michigan Houston, Texas  
State of Ohio Waterloo, Iowa  
State of Ohio Victoria, B. C.  
Duluth, Minn. Baton Rouge, La.  
Detroit, Mich. Atlantic City, N. J.  
Pueblo, Colo. E. Lansing, Mich.  
Idaho Falls, Idaho Globe, Arizona  
Ogden, Utah London, Ont., Can.  
Lorain Co., Ohio Henryetta, Okla.  
St. Paul, Minn. Seattle, Wash.  
Pittsburgh, Pa. Ferndale, Mich.  
Lincoln, Neb. McAlester, Okla.  
Birmingham, Ala. Negaunee, Mich.  
Columbus, Ohio Lawton, Okla.  
Havana, Cuba Crown Point, Ind.  
New Haven, Conn. Bay City, Mich.  
Great Falls, Mont. Roanoke, Va.  
Galveston, Texas Glendale, Calif.  
Pensacola, Fla. Hawaiian Islands  
Stillwater, Okla. Drumright, Okla.

## Want a Regular Monthly Salary?

Investigate this opportunity to earn a regular monthly salary and share in Rewards—the same opportunity which appealed to those hundreds of Institute of Applied Science Graduates now holding positions in the partial list of States, Cities and Institutions shown here. And one to fifteen I. A. S. Graduates are employed on regular monthly salaries by each bureau listed. Be a Finger Print and Secret Service Operator! Write for Free details how you can train at home in spare time to enter this young, swiftly-growing profession.

### FREE The Confidential Reports Operator No. 38 Made to his Chief!

Write or send coupon for Free Reports and Illustrated Finger Print Book... the same information requested by hundreds of I. A. S. graduates now earning a monthly salary!

**Institute of Applied Science, Dept. 13-54**  
**1920 Sunnyside Ave., Chicago, Ill.**

Gentlemen:—Without any obligation on my part whatever, send me the Reports of Operator No. 38, also your Illustrated Free Book on Finger Prints and your low prices and Easy Terms Offer. Literature will NOT be sent to boys under 17 years of age.

Name.....  
Address..... Age.....

## BE AN ARTIST

WE CAN TEACH YOU DRAWING in your own home during your spare time. Thirty-five years of successful teaching proves our ability. Artists receive large salaries.

Write today for Art Year Book  
**SCHOOL OF APPLIED ART**

Dept. 146, 10 E. Huron St., Chicago, Ill.



## ENGINEERING DEGREE IN TWO YEARS

B.S. Degree in Electrical, Civil, Chemical, Radio, Mechanical or Aeronautical Engineering in two years. Located in an industrial center with that Engineering atmosphere. Earn board. Low tuition. Preparatory Department. Enter June, Sept., Dec., March. Catalog.

**INDIANA TECHNICAL COLLEGE**

229 East Washington St., Fort Wayne, Indiana

## Learn Profitable Profession in 90 days at Home



Salaries of Men and Women in the fascinating profession of Swedish Massage run as high as \$40 to \$10 per week but many prefer to open their own offices. Large incomes from doctors, hospitals, sanitariums, clubs and private patients come to those who qualify through our training. Reducing alone offers rich rewards for specialists. Anatomy charts and supplies are given with our course. Write for details.

National College of Massage & Physio-Therapy, 20 N. Ashland Avenue, Dept. 477, Chicago, Ill.



**WHY NOT** spend spring, summer, fall, gathering butterflies—insects? I buy hundreds of kinds for collections. Some worth \$1 to \$7 each. Simple outdoor work with my instructions, pictures, price list. Profit. Pleasure. Send 10¢ (not stamps) for Illustrated Prospectus, terms, before sending butterflies. Mr. Sinclair, Dealer in Insects, Dept. 6, Box 1424, San Diego, Calif.

## BE A PASSENGER TRAFFIC INSPECTOR



Traffic is Increasing—Men Needed Now  
**RELIABLE MEN**—19 to 35—trained as Railway and Bus Passenger Traffic Inspectors are in demand. Household, interesting work. Complete our few weeks' home-study course, and we help place you at up to \$135 per month, plus expenses, to start, or refund tuition. Advance with experience. Write for Free Booklet. **STANDARD BUSINESS TRAINING INSTITUTE**, Div. 204, Buffalo, N. Y.

## LEARN CARTOONING

by the method that has developed hundreds successfully. Send name, address and age for free chart to test your ability.

The Landon School, 1738 National Bldg., Cleveland, Ohio

## LEARN WATCHMAKING AND ENGRAVING

BY OUR PROFIT-SHARING PLAN  
**OUR GRADUATES SUCCEED**

One of our Iowa students started in a very small way—now doing over \$30,000 a year. Another in Wisconsin, over \$10,000 the first year. Day or night classes. Call or write for FREE BOOK. **Chicago School of Watchmaking**, Dept. 3801, 155 N. Clark St., CHICAGO.

## GOV'T. JOBS

**SALARY TO START \$90 to \$175 MONTHLY MEN WOMEN Age Range 18 to 50**

( ) Village Carrier ( ) POSTMASTER  
( ) P. O. Laborer ( ) Steamfitter  
( ) R. F. D. Carrier ( ) Auditor  
( ) Special Agent ( ) Stenographer  
( ) Customs Inspector ( ) U.S. Border Patrol  
( ) City Mail Carrier ( ) Telephone Opr.  
( ) P. O. Clerk ( ) Watchman  
( ) Matron ( ) Meat Inspector  
( ) Special Investigator ( ) Secret Service Opr  
( ) Typist ( ) File Clerk

**GOVERNMENT INSTRUCTION SERVICE**  
Dept. 111 St. Louis, Mo.

Send me FREE particulars "How to Qualify for Government Positions" marked "X". Salaries, locations, opportunities, etc. ALL SENT FREE

Name.....  
Address.....

When writing please mention Popular Mechanics



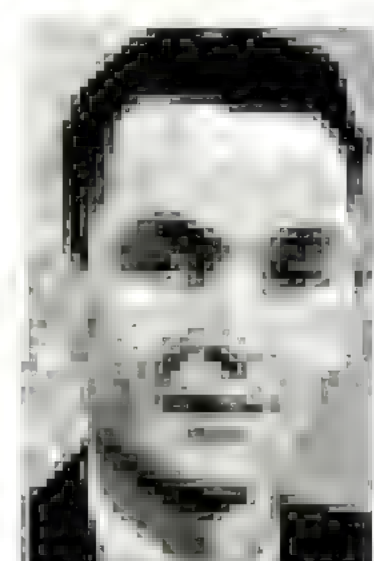


## HERE'S PROOF that my training pays

**\$3200  
in  
1933**



**More  
Work  
Than He  
Can Do**



"My books show that for the year 1933 I ran \$3200. Radio service doesn't come too tough for me now. You know who taught me Radio?—N.R.I."—J. P. WILSON, Box 43, Westville, Okla.

"At times I have more work than I can do. I average \$400 to \$500 profit a year in spare time. I can always make a good living in Radio."—GORDON ANGIN, 1815 Barrett Avenue, Richmond, Calif.



**Picked Up  
\$1800  
While  
Studying**

"I picked up \$1,800 while studying, and I call that easy money—the time I gave my Radio work did not interfere with my other business."—OTIS DENTON, 14105 Lorain Avenue, Cleveland, Ohio.

**MAIL  
THIS  
NOW**

## I'LL TRAIN YOU AT HOME In Your Spare Time For A GOOD RADIO JOB

MAIL THE COUPON NOW. Get the facts about Radio—the field with a future. N. R. I. training fits you for jobs in connection with the manufacture, sale and operation of Radio equipment. It fits you to go in business for yourself, service sets, operate on board ships, in broadcasting, television, aviation, police Radio and many other opportunities. My FREE book tells how I train you quickly at home in spare time to be a Radio Expert.

**MANY RADIO EXPERTS MAKE \$30, \$50, \$75 A WEEK**  
Why struggle along in a dull job with low pay and no future? Start training now for the live-wire Radio field. I have helped many men make more money. Hundreds of successful men now in Radio got their start through N. R. I. training.

**MANY MAKE \$5, \$10, \$15 A WEEK EXTRA  
IN SPARE TIME WHILE LEARNING**

Hold your job. I'll not only train you in a few hours of your spare time a week, but the day you enroll I start sending you Extra Money Job Sheets which quickly show you how to do Radio repair jobs common in most every neighborhood. I give you Radio Equipment for conducting experiments and making tests that teach you to build and service practically every type of receiving set made. James R. Ritz, 3525 Chapline Street, Wheeling, W. Va., writes: "During my training, my spare time earnings netted me an average of \$1000 to \$1500 yearly."

### FIND OUT WHAT RADIO OFFERS

My book has shown hundreds of fellows how to make more money and win success. It's FREE to any ambitious fellow over 15 years of age. Investigate. Find out what Radio offers you. Read what my graduates are doing and making, about my Money Back Agreement, and the many other N. R. I. features. Mail the coupon in an envelope, or paste it on a 1c post card TODAY.

**J. E. SMITH, President, Dept. 6DP  
National Radio Institute, Washington, D. C.**

**J. E. SMITH, President, Dept. 6DP  
National Radio Institute, Washington, D. C.**

Dear Mr. Smith: Without obligating me, send your book which points out the spare time and full time opportunities in Radio and your 50-50 method of training men at home in spare time to become Radio Experts.  
(PLEASE PRINT PLAINLY)

NAME.....AGE.....

ADDRESS.....

CITY.....STATE.....



**J. E. SMITH, President  
National Radio Institute**

The man who has directed the Home-Study Training of more men for the Radio Industry than any other man in America.



When writing to advertisers please mention Popular Mechanics



# There's Quicker, Bigger MONEY for YOU in POULTRY RAISING!



Wherever You Live—  
Whatever You Do Now—  
\$1000 to \$3000 a Year  
Can Be Yours!



## YOU Can Do What They Have Done

"You have opened up to me a pleasant and profitable way of gaining an independent living," Seldon Anderson, R. I.

"When I enrolled for your course, I knew nothing about poultry keeping. I am now successfully operating a commercial poultry farm." W. J. Wasthen, Conn.

F. O. Anderson, Phoenix, Ariz. writes: "Thanks to N. P. I. I got a job even before I finished your course."

## Spare Time or Full Time YOU Can Cash-In BIG

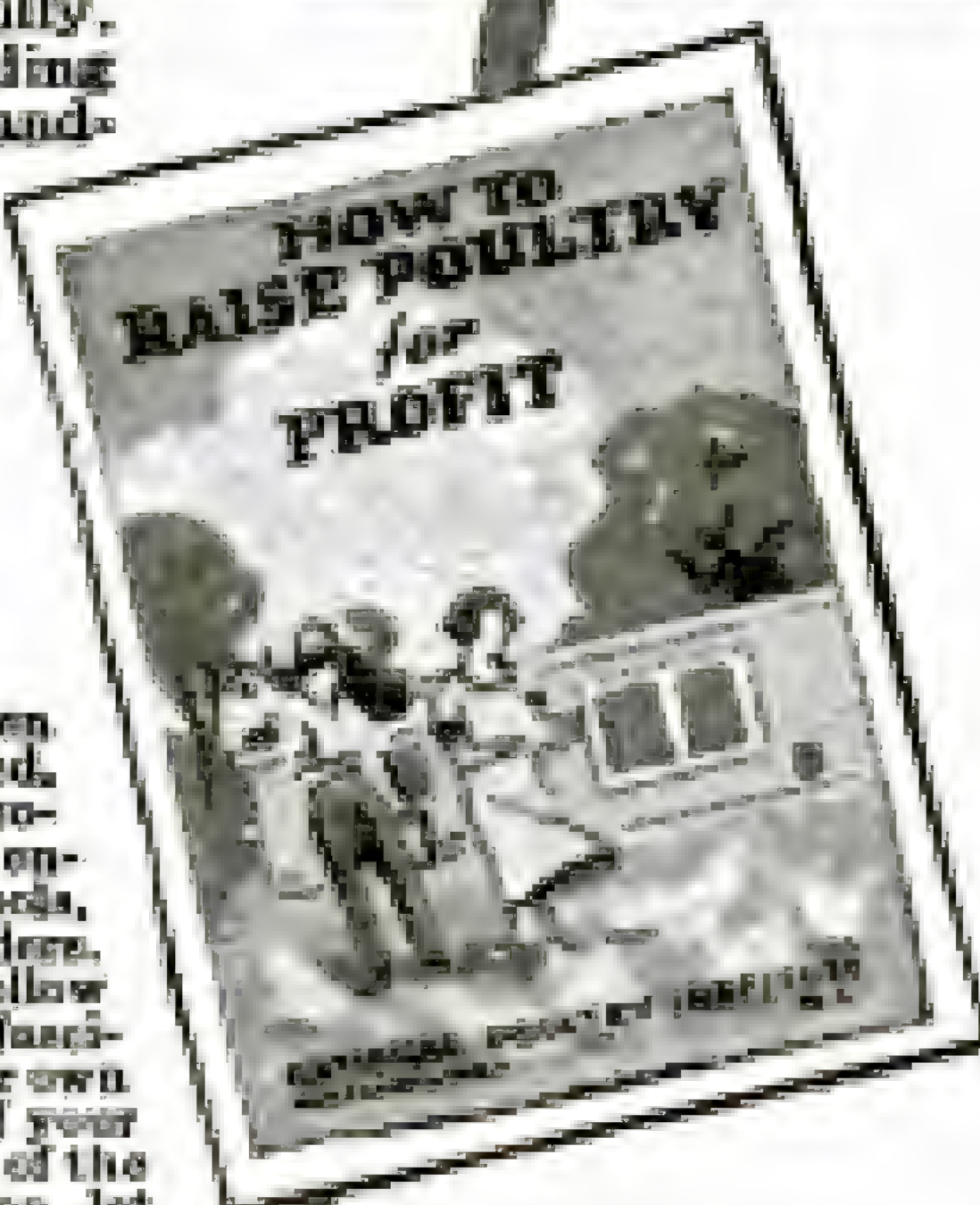
Instead of knocking at your door, Opportunity is waiting for you in your back yard! Thousands have turned to Poultry Raising for PART TIME EXTRA MONEY or FULL TIME BIG PAY. Many start off in just a small way—with a back-yard or vacant lot flock. My profit-producing methods will make only a few hens pay. No matter what you're doing now—I will show you how to start and keep going successfully. Eggs and poultry meat are commanding high prices—prices that mean a handsome margin of profit on every egg or bird you can produce. There's not a doubt about it—YOU CAN CASH-IN BIG. I'll PROVE that I can put YOU among the big money makers—QUICK.

## My Proved Methods Assure Success Right from START

All the "mystery and guess work" are taken out of poultry raising by my sure, tested, proved methods. My home study course, produced by eighteen famous experts and endorsed by thirty leading Agricultural Schools, puts in your hands the success-secrets of leaders. Satisfaction absolutely guaranteed, if you follow our methods. Decide now to get into this fascinating, healthful, profitable business. Be your own boss—make \$1.00 to \$3.00 for every hour of your spare time—or qualify for a fine salary in one of the big established poultry plants. From now on, let the other fellow pay YOU the fancy prices—Become depression-proof.

## FREE BOOK EXPLAINS

My big, new, free book, "How to Raise Poultry for Profit" will amaze you! Brings absolute proof of what my course and training have done for thousands of others. My 44 years' experience as Commercial Poultryman and former Senior Poultryman in the U. S. Dept. of Agriculture is yours to use and profit by. Get in line for QUICKER, BIGGER MONEY. Don't delay a day. Get this coupon into the very next mail.



32 Pages  
of Money-  
making FACTS

## Get this FREE Book NOW!

Harry M. Lamon, President,  
The National Poultry Institute  
Adams Center, N. Y. Dept. 36-A

I want to know how to make big money raising poultry. Send me your FREE book explaining your home-study course and PROVED methods.

Name.....

Address.....

City.....State.....

# Law!

## LEARN AT HOME

Are you adult, alert, ambitious, willing to study? Investigate LAW! We guide you step by step—furnish all texts, including 14-volume Law Library. Training prepared by leading law professors and given by members of bar. Degree of LL. B. conferred. Low cost, easy terms. Send NOW for Free, 64-page "Law Training for Leadership."

LaSalle Extension University, Dept. 464-L, Chicago

## PARKS AIR COLLEGE

PARKS AIRPORT

EAST ST. LOUIS, ILL.

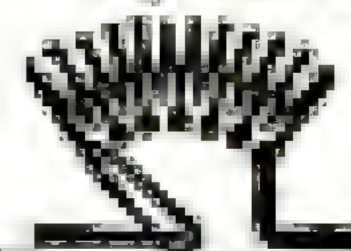
## Offers you college education majoring in aviation

Three 2-year courses leading to B.S. Degrees in Aeronautical Engineering, Aviation Administration, Aviation Mechanics. 100 acre airport. 14 buildings. 25 in faculty. 5,000,000 miles flight training. 1463 planes, 438 motors repaired and rebuilt in shops. Graduates with all leading aviation companies. Dormitories, cafeteria on field. Summer term July 6. Catalog. Write

9th YEAR REGISTRAR, DEPT. PM-4  
PARKS AIRPORT, EAST ST. LOUIS, ILL.

# ELECTRICAL ENGINEERING

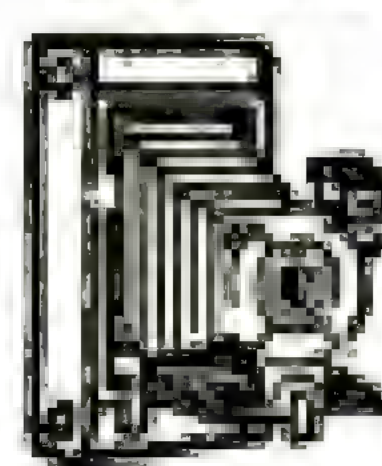
A BROAD, basic, intensive course complete in one school year. Includes fundamentals of Refrigeration, Air-conditioning, Electronics. Approved by educators, endorsed by industry. 44th year. Catalog.



## BLISS ELECTRICAL SCHOOL

134 TAKOMA AVE., WASHINGTON, D. C.

# MAKE MONEY with Your CAMERA



Magazines, newspapers, advertisers buy millions of photos a year from people who know how to take the kind of pictures wanted! Let us teach you, at low cost, in your spare time, how to take real human-interest pictures that sell! Our marketing service helps you to quick, nation-wide sales. Send for Free Book that tells how to earn while you learn. UNIVERSAL PHOTOGRAPHERS, Dept. 74, 10 W. 33d St., New York City

LEARN  
AT HOME

## You Can Regain Perfect Speech, if you

# STAMMER

Send today for beautifully illustrated book entitled "DON'T STAMMER," which describes the Bogue Unit Method for the scientific correction of stammering and stuttering. Method successfully used at Bogue Institute for 35 years—since 1901. Endorsed by physicians. Full information concerning correction of stammering sent free. No obligation. Benjamin N. Bogue, Dept. 165, Circle Tower, Indianapolis, Indiana.



## Learn CHALK TALKING

Entertain for all occasions. Send \$1.00 for Laugh Producing Program of 23 Trick Drawings with Instructions. Catalog of Chalk Talk Supplies Free.

BALDA ART SERVICE, Dept. K, Oshkosh, Wis.

# RADIO

ENGINEERING, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. Nine months' engineering course equivalent to three years' college radio work. School established 1874. All expenses low. Catalog free.

Dodge's Institute, Ada St., Valparaiso, Ind.



## LOOK! Baby Chicks THOUSANDS WEEKLY ALL YEAR


Finest quality & Layers in 40 breeds. Hybrid Baby Pullets and Cockrels. H. W. D. Tested. Ducklings, Goslings, Baby Turkeys, Guinea. In business 27 years. Catalog free. Nabel Hatcheries, Box M, Gambier, Ohio.

When writing please mention Popular Mechanics



*Climaxing 31 years of  
successful, practical Training progress*

**NATIONAL SCHOOLS** *ANNOUNCE*  
A HIGHLY DEVELOPED DUAL COURSE IN **GAS and**  
**DIESEL**  
**ENGINEERING**



## Ambitious Men of All Ages Can Qualify for Good Pay Jobs in the Fast Growing Diesel Trade

Established in 1905, National Schools' course of Diesel Training is the outgrowth of years of successful development. The instruction is **PROVEN**. Over 30,000 graduates have received National Training. Now, National offers the most comprehensive training—actually two complete courses for the price of one—Gas and Diesel Engineering. Both courses are absolutely essential to qualify for best jobs.

### Easy, Fascinating "Shop-Practice" Method

The day you begin your Training at National you start right in with a practical job on the most modern Gas and Diesel equipment, including Caterpillar, Cummins, McCormick-Deering, Hercules, Venn-Severn, Fairbanks-Morse, Enterprise, and many others. The work is actually a pleasure for students—easy to understand—ever-fascinating. You learn in a few months what would ordinarily take far longer.

### No Dummy Equipment at National

The vast installation of modern Gas and Diesel equipment here is all used by you in learning your trade. You learn to assemble and dis-assemble all parts, learn trouble-shooting; operating and all essentials to qualify you for big-pay Gas and Diesel opportunities. Your instruction is personalized under direct supervision of a large staff of experts.

### LEARN IN LOS ANGELES, Playground of America RAILROAD FARE ALLOWED EARN ROOM AND BOARD

For a limited time, coach R. R. fare allowed to L. A. from any part of the U. S.

We help students obtain part-time jobs to earn room and board while learning.

### FREE BOOK OF FACTS

### MAIL THIS COUPON

NATIONAL SCHOOLS, Los Angeles, Calif.  
Dept. PMA-4, 4000 So. Figueroa St.

NAME .....

ADDRESS .....

CITY.....STATE .....



Assembling Enterprise Diesel.



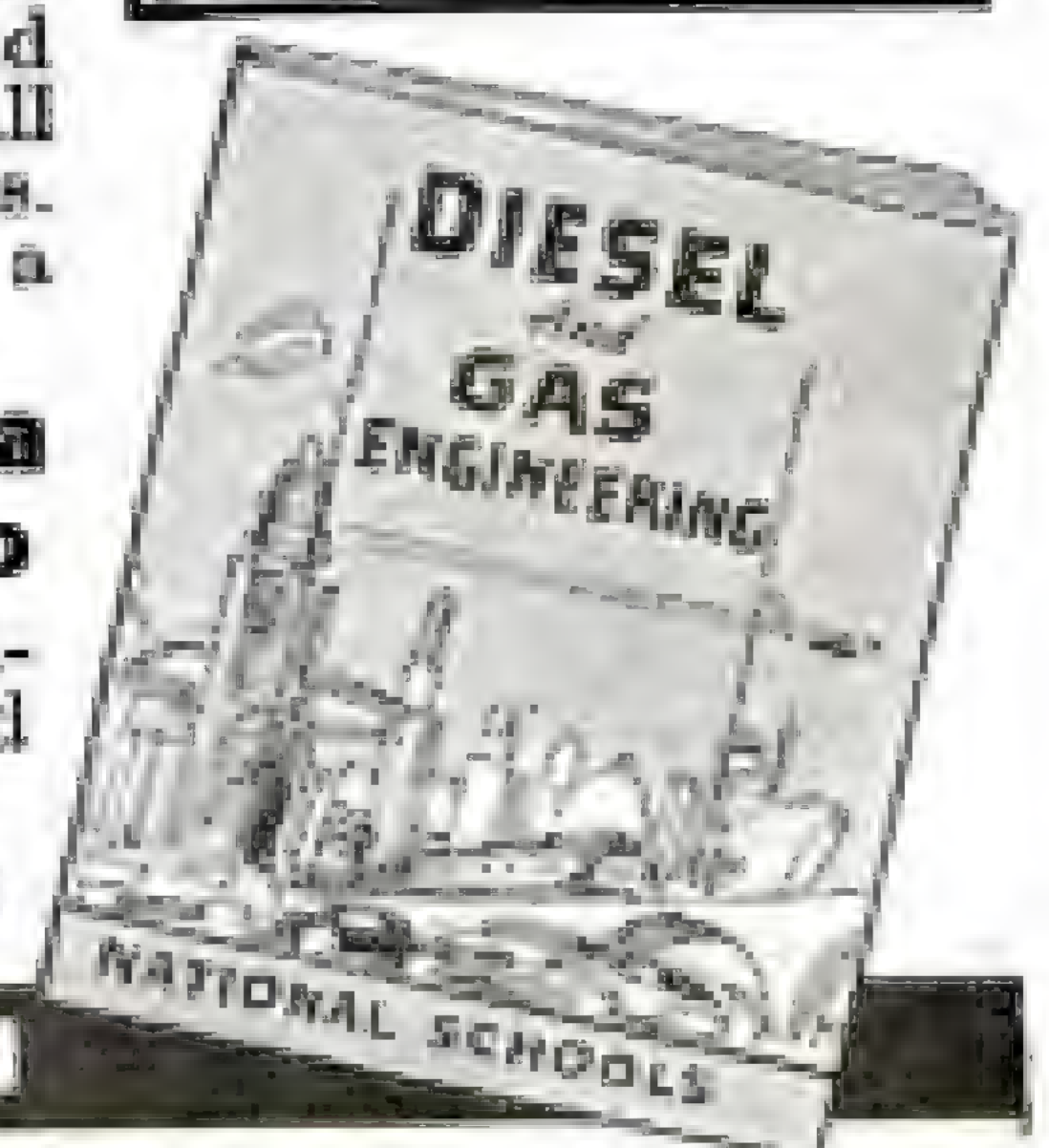
Trotting Marine Diesel.



Checking Pump on McCormick-Deering.



Adjusting Starter on Caterpillar Diesel.

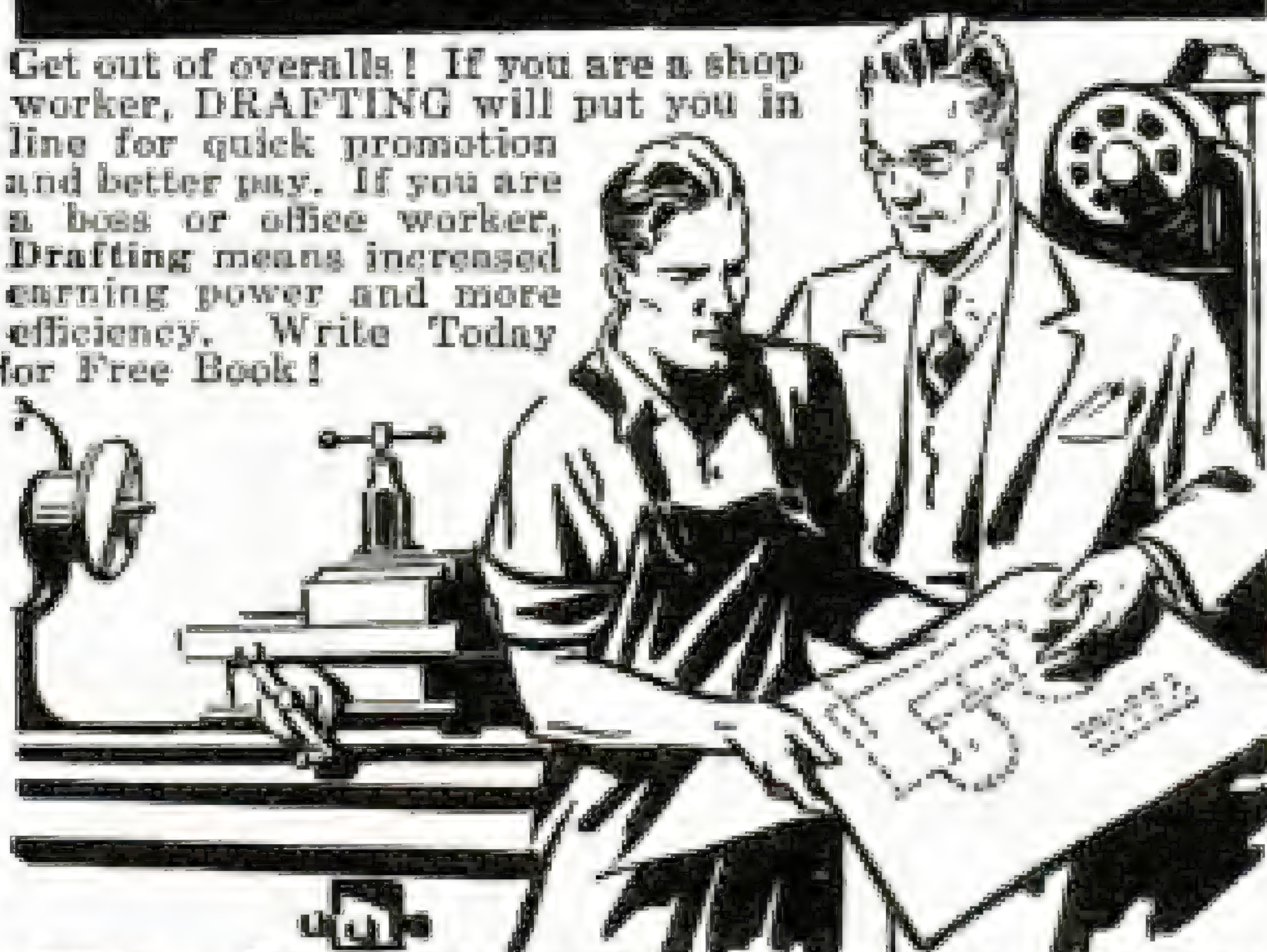


When writing to advertisers please mention Popular Mechanics



# MORE PAY and a better JOB!

Get out of overalls! If you are a shop worker, DRAFTING will put you in line for quick promotion and better pay. If you are a boss or office worker, Drafting means increased earning power and more efficiency. Write Today for Free Book!



## The Road to Advancement DRAFTING

In every walk of life practical training in DRAFTSMANSHIP will prove valuable. Even if you don't accept a job as a DRAFTSMAN, you will be money ahead by taking Engineer Dobe's Course. You will be amazed at the speed with which you can learn in your own home in your spare time by Engineer Dobe's PRACTICAL METHOD.

## JOBS NOW OPEN

In all industries, Drafting leads the way. In Aviation, Electricity, Building, Machinery, Automobile, Draftsmen must be used, and their work comes first. Recovery in industry and building is definitely on the way. Many trained Draftsmen will be needed on better jobs at better pay and shorter hours. Prepare NOW!

## Learn at Home From an Engineer

I will teach you my practical method that has been successful with thousands since 1900. I will furnish you with all tools and a drawing table. I will teach you in a very short time by mail in your spare time until you actually have a desirable Draftsman's job, or prepare you for better pay in the job you now have. No High School or previous experience needed. You must be entirely satisfied with my personal training UNTIL COMPETENT and until assisted to a position, OR YOU GET ALL YOUR MONEY BACK. Start NOW and get the training. Prepare for more pay and a better job. Send the coupon below TODAY! Time is money! Don't delay! No obligations!

Complete Outfit,  
size 20x25 in.,  
furnished  
to you.

These TOOLS and Other  
EQUIPMENT  
Given When You Start

# Free Book!

ENGINEER DOBE, Div. 33-74 Libertyville, Ill.

Send me your free book, "Successful Draftsmanship" and explain how you will assist me to a good position as a draftsman.

Name..... Age.....

Address.....

Post Office..... State.....

## Strange NEW KIND OF PICTURE

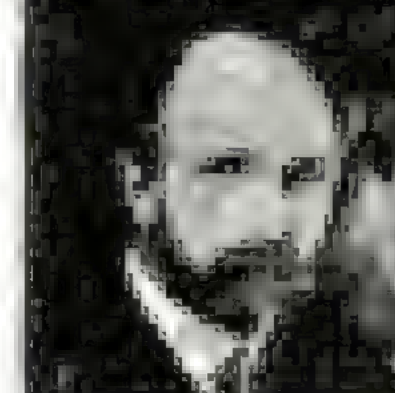
Excites Everyone—Sells on Sight

HARD to believe when you see it—impossible to describe—a sensational mystery invention makes any snapshot into a Portrait that looks like it was painted on Porcelain. Indestructible. Everlasting. Breath-taking beauty makes sales on sight. Automatic repeater—low price—high commissions—monthly bonus checks. Send name and find out FREE how and where to see sample and get your own portrait without cost.



LIFETIME PORTRAITS SOCIETY, Dept. 104,  
1037 Evans St., Cincinnati, Ohio

## New Way to Improve YOUR ENGLISH



A command of effective English gives you added advantages and better opportunities. Poor English handicaps you more than you will ever realize. You can improve your English through Sherwin Cody's 100% self-correcting invention.

If you are ever embarrassed by mistakes in grammar, spelling, punctuation, or pronunciation, this new free book "How You Can Master Good English in 15 Minutes a Day" will prove a revelation to you. Send for it now. It is free. Address

SHERWIN CODY SCHOOL OF ENGLISH  
54 Searle Building Rochester, N. Y.



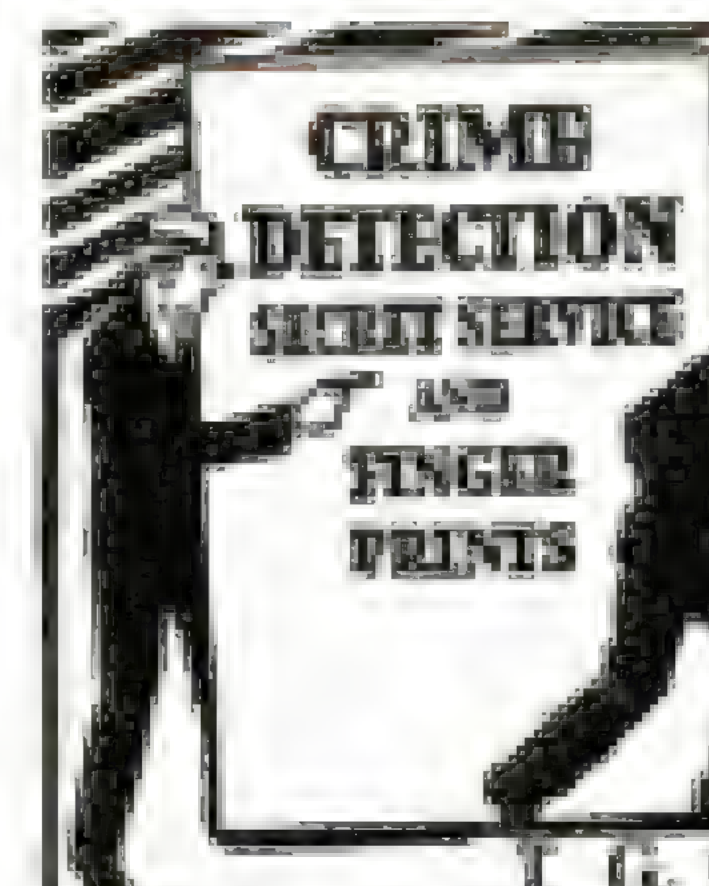
## TRI-STATE COLLEGE

B. S. Degree in 2 years. World famous for technical 2-year courses in Civil, Electrical, Mechanical, Chemical, Radio, Aeronautical Engineering; Business Administration and Accounting. Equivalent in technical hours to 4-year course. Those who lack

high school may make up work. Low tuition. Low living costs. Located in picturesque hill and lake region. Students from every state and many foreign countries. 53rd year. Enter Jan., March, June and Sept. Write for catalog.

446 COLLEGE AVE.,

ANGOLA, IND.



**SECRET SERVICE BOOK FREE**  
For 30 Days Reading  
No Money Down—Actual Crime Cases—  
If You Act Quick!—We will send you this stirring book on Crime Detection, Secret Service and Identification Work for 30 days free reading. Send no money. If you decide to keep it, then send only \$1.00. If not, return it. WRITE TODAY. Not sent to boys under 17 years of age.

T. G. Cooke, Dept. 13-54, 1920 Sunnyside Ave., Chicago



**NEW BOOKS FOR RACE FANS**  
\$1 buys you AUTOMOBILE RACING 4th Edn.: 80 illustrations; drivers and world's fastest cars; midsize; Indpls. Miller-Fords, Campbell's 260 mph Beach Car; 3 sets working dogs. \$2 buys you Peter DePaolas' WALL SMACKER; a big book full of thrills, spills, laughs (and chills). Ray F. Kuna, Dept. B-19, Madisonville, Cincinnati, O.

**MAKE MONEY**

## AT HOME!

Learn to color photos and miniatures in oil. No previous experience needed. Good demand. Send for free booklet, "Make Money at Home" and requirements.

NATIONAL ART SCHOOL  
3601 Michigan Ave. Dept. 1354 Chicago

## MAIL FOR FREE INFORMATION

BEDFORD

YMCA

TRADE

SCHOOL

1117 Bedford Ave., Dept. PM-35  
Brooklyn, New York City, N. Y.

- ☐ Auto Mechanic ☐ Talking Pictures
- ☐ Aviation Mechanic ☐ Welding
- ☐ Aeronautical Engineering
- ☐ Refrigeration ☐ Machine Shop
- ☐ Oil Burner ☐ Diesel Engineering
- ☐ Air Conditioning ☐ Sign Painting
- ☐ Electrical ☐ Window Display
- ☐ Radio and Television Mechanic
- ☐ Architectural-Mechanical Drafting
- ☐ Armature Winding
- ☐ Diesel Engines

Name.....

Address.....



*These  
Factory*  
**ENGINEERS**  
WILL SUPERVISE  
YOUR TRAINING  
AT HOME FOR  
**JOBS**  
THAT PAY UP TO  
**\$75** *a week*  
*in* **RADIO**  
PHOTO CELL · PUBLIC  
ADDRESS · TELEVISION ·  
SOUND PICTURE WORK  
•  
**EARN WHILE YOU  
LEARN**

### "Shop Training" for the Home

R-T-I Training is different than any training you ever heard about. It comes to you right from the heart of the Radio Industry—right out of the factories where Radio sets and other vacuum-tube devices are made. It was planned and prepared and is supervised by big radio engineers IN these factories—by men appointed for the purpose. This means that trained the R-T-I way, you'll be trained as the Radio Industry wants you trained—just as the Radio Industry, itself, would train you if it was doing the job.

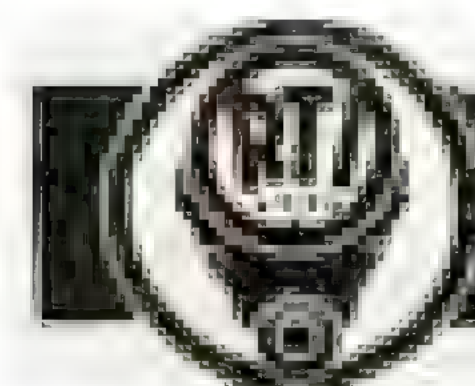
### Television Included

Radio service work is only the starting point. R-T-I will take you through the whole field of Radio and Electronics. You will learn about every new development, including Television so you'll be ready when Television breaks. You'll also learn the big money subjects of Aviation and Auto Radio; Public Address Systems; how to handle Photo Cells; Sound Picture Recording, Etc.

### 4 Working Outfits Furnished

Start almost at once doing part time radio work. I furnish 4 outfits of apparatus that you build into test equipment with which you can do actual jobs and earn extra money. My Training pays its own way and you get your money back if not satisfied.

RAY D. SMITH, President



**RADIO AND TELEVISION INSTITUTE**  
PRACTICAL SHOP TRAINING FOR THE HOME

DEPT. 14 • 2130 LAWRENCE AVENUE • CHICAGO

When writing to advertisers please mention Popular Mechanics

### Appointed by Radio Manufacturers to Supervise R-T-I Training

This is the R-T-I Advisory Board—Engineers and Executives of large Radio firms—appointed by these firms to supervise and direct R-T-I

Training. Put your future in their hands. 50 great radio manufacturers now endorse this Training.



### TRAIN NOW For Good Pay Spare-Time and Full-Time Jobs

If you're dissatisfied with small pay—lay-offs and an uncertain future—here's an opportunity that's too good to miss. At the cost of only the time it takes you to mail the coupon, you can get my big FREE book, "RADIO'S FUTURE AND YOURS." This book tells how you can learn at home under the supervision of factory engineers, to make more money almost at once in Radio—whether you want to make Radio your life's work, or use it to pick up an extra \$5 to \$20 a week in your spare time.

### More Opportunities Than Ever Before

Radio is still forging ahead. 1935 was its biggest year. Over 5 million new sets sold. Over 30 million dollars paid for service alone in 1935. Where only a few hundred men were employed a short time ago, thousands are employed today. And where a hundred jobs paid up to \$75 a week—there are thousands of such jobs today—many R-T-I Trained Men earn even more. And new jobs are being created all the time—full time jobs and spare time jobs. Get my book and see how easy it is to learn at home for this good-pay work.

### Age or Lack of Experience No Handicap

You don't have to be a high school graduate, nor even have finished the grades. My Training is so simple, easy, and practical, that the average man, regardless of age, education, or previous experience can master it. It offers the chance you have wanted to get out of a small-pay, no-future job, into good pay work with a future, in Radio and all its branches.

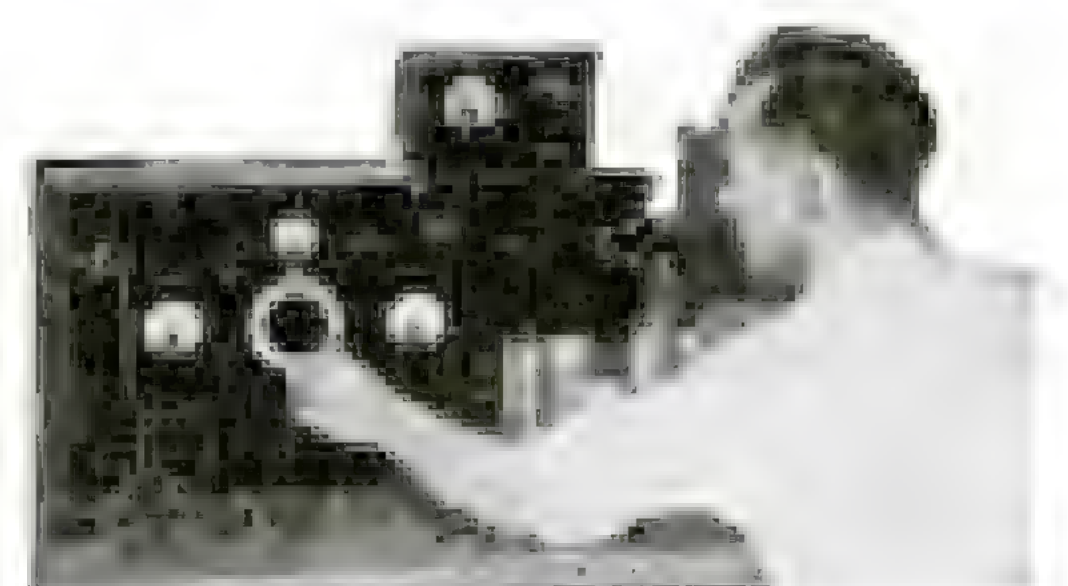
### Get My Free Book

INVESTIGATE! Learn why R-T-I Training is different. Find out why R-T-I Trained men get "Quick Results" and "Big Results." Send for your copy of "Radio's Future and Yours" today. It tells you about Radio's amazing opportunities. It describes my approved training. It tells what R-T-I students are doing and making. It gives the names of my Advisory Board and 50 endorsing manufacturers. It's FREE. Clip, sign and mail coupon RIGHT NOW!



### Big Money in Auto and Police Radio Work

W. H. Carr, 402 N. 16th St., Kansas City, Kansas, an R-T-I student, has charge of 35 radio equipped cars for the Kansas City Police and Fire Departments. His salary is \$230.00 a month and he is furnished with an automobile, gas, oil, etc. He says, "If I had not taken your course I would not be able to hold this job."



### Makes \$600 in One Month

Herbert B. Thomson, Gorman, Texas, formerly an oil well driller, borrowed \$170.00 to start a spare time radio business after completing 12 R-T-I lessons. In two years his shop was worth \$3500. He says, "Because of my R-T-I Training I made \$450 in September and over \$600 in October 1935. It pays to be R-T-I Trained."

### MAIL FOR FREE BOOK

Ray D. Smith, President,  
RADIO AND TELEVISION INSTITUTE  
2130 Lawrence Ave., Dept. 14, Chicago, Ill.

Without obligation, send me a copy of "Radio's Future and Yours." I am interested in your training and the opportunities in the great field of Radio for the R-T-I Trained Man.

Name.....

Address.....

City.....State.....



## HOW TO GET THE BEST RESULTS with Your Harmonica

The harmonica is such a popular and widely used instrument that we are anxious that all boys and girls should understand its full possibilities so as to get the best musical results. To do this a selection of the proper type of harmonica is desirable.

For instance, for the clear, sweet tone of the violin, a single reed Hohner Harmonica such as the Marine Band is suggested.



The "Marine Band" simple and true in tone.  
Price.....65c

\* \* \*

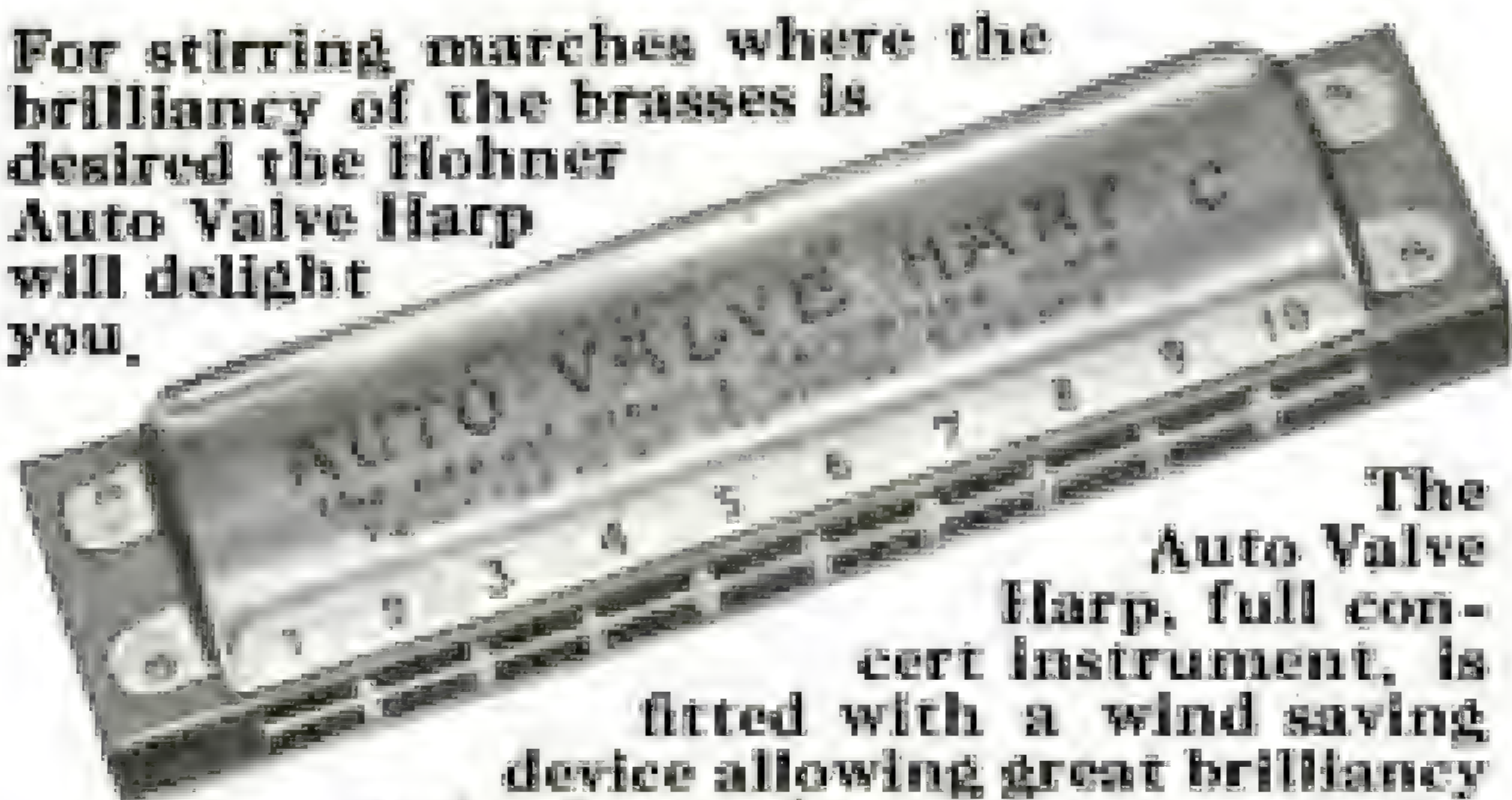
For the ballad type of music, calling for the sustained, appealing tones of the cello try a Hohner tremolo Harmonica.



The "Marine Band" Tremolo.  
Length 7 3/4 inches, 20 double holes, 40 reeds.  
Price.....\$1.25

\* \* \*

For stirring marches where the brilliancy of the brasses is desired the Hohner Auto Valve Harp will delight you.



The Auto Valve Harp, full concert instrument, is fitted with a wind saving device allowing great brilliancy and volume of tone.  
Price.....\$1.50

The above models are all available in the keys of A, B-flat, C, D, E, E-flat, F, G. Where two or more harmonicas are played together, all must be in the same key, but different models may be used to secure the desired musical results. This is done by the finest amateur and professional harmonica bands. All Hohner Harmonicas, of every type, are equally perfect in construction, workmanship and tone. Familiarize yourself with the various models that you may get the greatest enjoyment with your playing. Write for our Free Instruction Book and illustrated folder describing all Hohner Harmonicas. Address

**M. HOHNER, Inc.**

Dept. 990D, 351 Fourth Ave., New York City

# HOHNER HARMONICAS

When writing to advertisers please mention Popular Mechanics

## LEARN AUTO MECHANICS in 8 weeks!

### Diesel Engines and Aviation!

Prepare now for the wonderful opportunities. 8 weeks' training fits you for a job that's waiting for you or to open your own repair shop.

Livingston, Texas  
Dear Mac: I have been working mighty hard since I graduated from your school, with the Ford Motor Co. and am getting along fine. Of course I could not expect top wages at the start, but I have already had one salary increase. So I guess my work is entirely satisfactory, thanks to your school.  
Herman Wilson.

Clendenin, W. Va.  
Dear Mac: Send me a catalog, I just want to look over the old school. I am getting along fine, doing a good business, all thanks to you and your training. Will you send me another Diploma, as mine was destroyed. I was in the class of '21. I send my best regards to the instructors and to you also.  
Leo Foreman.

**FREE** Write today for Big Free Book. Get the facts about jobs; and Low Tuition Offers. Sending for this Book doesn't obligate you. It obligates ME to tell YOU how you can train for Big Money in eight short weeks. Address Dept. 10-28.

**McSWEENEY SCHOOLS**  
**AUTOMOBILE — DIESEL**  
**AVIATION GROUND MECHANICS**  
**CLEVELAND, OHIO or KANSAS CITY, MO.**

## ENGINEERING



INTENSIVE PRACTICAL TECHNICAL COURSES. Non-residence method. TIME AND MONEY SAVED. Degree in 2 yrs. Electrical, Mechanical, Structural, Architectural, Civil, Aeronautical, Highway. Also shorter courses in Electricity, Radio, Electric Refrigeration, Power Plant, Drafting, Building, Low tuition. Extensive modern equipment. Part-time work for board and room. 34 yrs. experience producing successful men, located all over U. S. and foreign lands, holding responsible positions. Approved by industry, endorsed by graduates and educators. Catalog free.

**FINLAY ENGINEERING COLLEGE**  
1001 Indiana Avenue Kansas City, Mo.

## High School Course in 2 Years

You can complete this simplified High School Course at home as rapidly as your time and abilities permit. Many finish in 2 years or less. Course prepares you for entrance to college. Standard H. S. texts supplied. Diploma awarded. Credit for H. S. subjects already completed. Single subjects if desired. Free Bulletin on request. American School, Dept. H-445, Drexel at 58th, Chicago

## Amazing Sensational Discovery REFINISHES AUTOS LIKE NEW!

NOT A WAX OR POLISH—LASTS 8 to 12 MONTHS—SHABBY CARS GIVEN NEW LUSTER AND SHINE



Men — it's unbelievable, a miracle! KAR-NU refinishes old shabby cars in a few minutes. Gives them like-new shine. Not a polish, wax, or paint, but a real finish that lasts 8 to 12 months. Stands washing, sunning, long wear. No rubbing—no polishing — no waxing. Just apply with rag. Guaranteed.

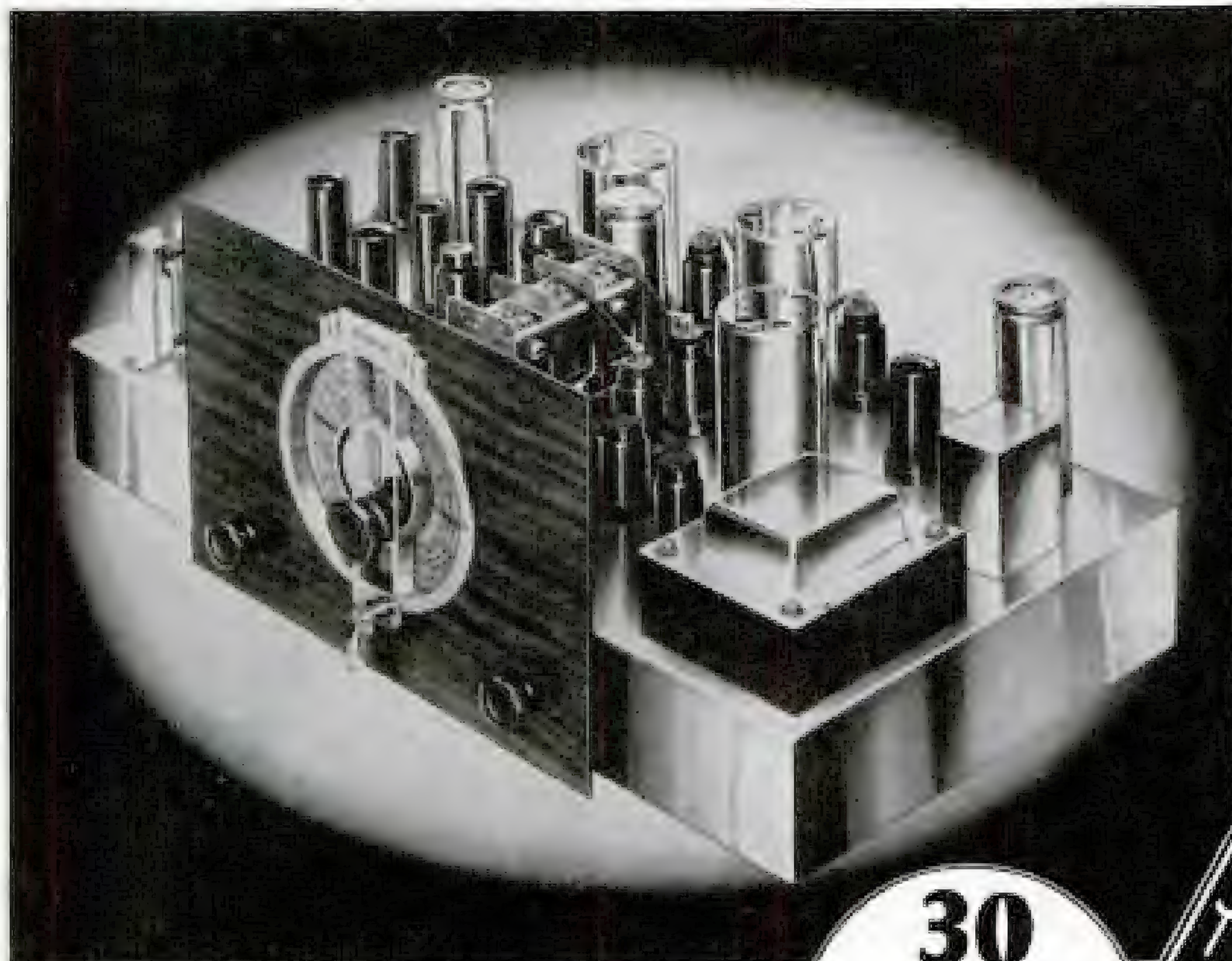
### FREE SAMPLE

What a profit-maker for agents and distributors! Millions of cars need this new LOW PRICED auto finisher. BIG PROFITS—up to \$7.00 in an hour, easy. Ten second demonstration on any man's car sells him QUICK. Hurry—get FREE SAMPLE which proves all claims. Write or wire today. Distributors Wanted in Foreign Countries. KAR-NU CO., Dept. Z-30, Oakley, Cincinnati, Ohio



# Again... MIDWEST RADIO

## Proves Its Leadership!



with a  
**MARVELOUS NEW**

# 14-Tube

**FIVE WAVE BAND,  
WORLD WIDE SET  
9 TO 2400  
METERS**

**DEAL DIRECT WITH LABORATORIES  
SAVE UP TO 50%**

**30  
DAYS  
FREE  
TRIAL**

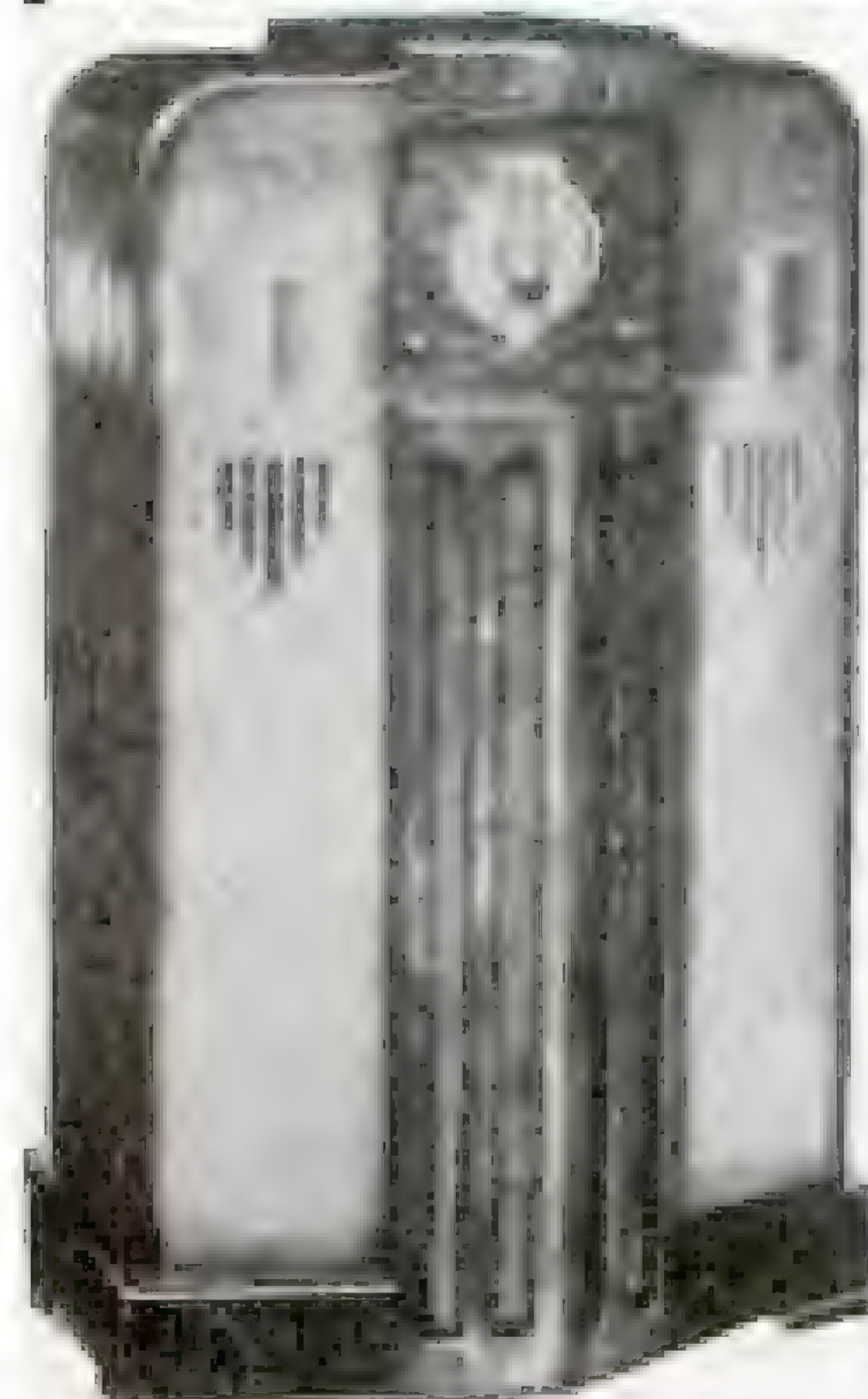
ONCE again, Midwest demonstrates its leadership by offering the world's most powerful Super DeLuxe 14-METAL Tube 5-band radio. It is a master achievement... today's most highly perfected, precisely built, laboratory adjusted set. It is a radio-musical instrument that will thrill you with its marvelous super performance... glorious new acousti-tone... crystal-clear "concert" realism... and magnificent foreign reception. Before you buy any radio, write for FREE 40-page 1936 catalog. Learn about the successful Midwest Laboratory-To-You policy that saves you 30% to 50%... that gives you 30 days FREE trial. This super radio will out-perform \$100 and \$200 sets on a side by side test. It is so powerful, so amazingly selective, so delicately sensitive that it brings in distant foreign stations with full loud speaker volume, on channels adjacent to powerful locals. The 14 tubes permit of advanced circuits, make it possible to use the tremendous reserve power, and to exert the sustained maximum output of the powerful new tubes.

### 50 SENSATIONAL ADVANCEMENTS

Scores of marvelous Midwest features, many of them exclusive, explain Midwest glorious tone realism, super performance and thrilling world-wide 5-band reception. They prove why nationally known orchestra leaders like Fred Waring, George Olsen, Jack Deany, etc., use a Midwest in preference to more costly makes. Five tuning ranges make it easy to parade the nations of the world before you. You can switch instantly from American programs... to Canadian, police, amateur, commercial, airplane and ship broadcasts... to the finest and most fascinating programs from Europe, Africa, Asia, Australia South America... 12,000 miles away.

### Acousti-Tone V-Spread Design (U. S. Design Patent No. 26753)

The V-Front Dispersing Vanes established a new radio style overnight. They spread the beautiful lace-work of the "highs" throughout the room in a scientific manner... directing the High Fidelity waves uniformly to the ear. Now, get complete range of audible frequencies... achieving glorious new acousti-tone... assuring life-like crystal-clear "concert" realism. No middlemen's profits to pay. You buy at wholesale prices, direct from Laboratories... saving 30% to 50%. You can order your 1936 Midwest radio from the new 40-page catalog with as much certainty of satisfaction as if you were to come yourself to our great laboratories. You save 30% to 50%... you get 30 days' FREE trial... as little as \$5.00 down puts a Midwest radio in your home. You are triply protected with a One-Year Guarantee, Foreign Reception Guarantee, Money-back Guarantee.



**\$39.50**  
with New  
**AUDITORIUM TYPE  
SPEAKER**  
(Less Taxes)  
**EASY  
PAYMENT  
TERMS**



#### Ted Weems Enthusiases Over Foreign Reception

"After comparing many radios, I can truthfully say that my Midwest out-performs other sets costing almost twice as much. In all my experience, I have never heard such life-like reproduction. My Midwest surpasses all my expectations, and in my opinion, is the finest radio receiver obtainable."  
TED WEEMS.

Send for FREE 40-page four-color catalog. It pictures the complete line of beautiful 1936 Midwest Acousti-Tone V-Spread consoles and chassis... in their natural colors.



#### MAIL COUPON TODAY for

**Free 30-DAY TRIAL OFFER  
and 40-PAGE FOUR-COLOR Free CATALOG**

**MIDWEST RADIO CORPORATION**  
Dept. 15L, Cincinnati, Ohio

Without obligation on my part, send me your new FREE catalog and complete details of your liberal 30-day FREE trial offer. This is NOT an order.

User-Agents  
Make Easy  
Easy Money  
Check ☐  
Here ☐  
for details.

Name \_\_\_\_\_

Address \_\_\_\_\_

Town \_\_\_\_\_

State \_\_\_\_\_

Check ☐ if interested in a Midwest All-Wave Battery Radio

**MIDWEST RADIO CORP.**

DEPT. 15L CINCINNATI, OHIO U.S.A.

Established 1920 Cable Address MIRAGO All Codes

When writing to advertisers please mention Popular Mechanics





**HERE'S YOUR CHECK  
YOUR DRAWING IS O.K.**

Some men make more money playing than others do working. They have been far-sighted enough to turn a hobby into a real source of money. Perhaps you've always liked to take a pencil and draw. Successful artists are simply men who have kept on drawing, studying and practicing, until they became expert. You may have just as much ability. It costs you nothing to find out—and it may be the most valuable discovery of your life.

The Federal Schools, affiliated with a large art, engraving and printing organization, has trained many young men and women now capable of earning \$1,000 to \$5,000 yearly as designers and illustrators. Its Home Study courses in Commercial Art, Illustrating and Cartooning, contain exclusive illustrated lessons by many famous artists. Practical instruction by experienced men is the reason for its many years of outstanding success. Courses sold on easy monthly payments.

Send today for Free Book, outlining present opportunities in Art, describing the training and showing reproductions of students' work. With it, you will receive our Free Vocational Art Test, which our artists will use to judge your ability. You may have real talent. Don't let it rust—it may bring you a good income and an easier, happier life. Just fill out and mail the coupon below.

## FEDERAL SCHOOLS, INC.

4136 Federal Schools Bldg.  
Minneapolis, Minnesota

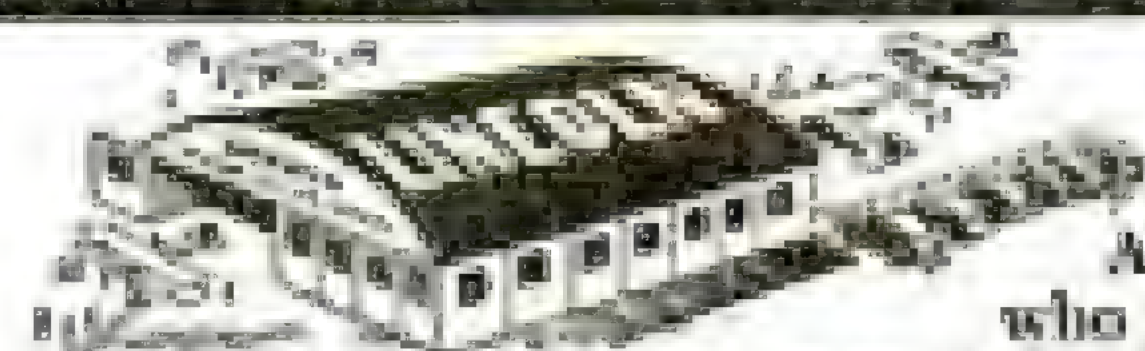
Send me your free Art Test and Book

Name.....

Address.....

Age..... Occupation.....

## To Earn More Money in AVIATION Train at LINCOLN\*



Aviation executives who pay \$200 to \$500 a month for Pilots and Mechanics demand men with thorough, expert training... the kind of Approved training Lincoln offers you. Training at this "World's Best Known Aviation School" is thorough from every standpoint.

### Get Your GOVERNMENT PILOT'S LICENSE—

Lincoln Flying School training includes everything to make you a first class Pilot. Here you train for Government License as Transport, Limited Commercial, Private or Amateur Pilot. You learn straight flying, night flying, blind flying by instrument, radio beam flying, cross country flying, aerobatics, spot landing, aerial navigation.

**GOVERNMENT MECHANIC'S LICENSE—**Lincoln Approved Mechanics School training gives you every requirement for Government License as Airplane and Engine Mechanic. You rebuild Whirlwind, Wasp, Cyclone, Aircraft Diesel and many other aircraft engines. You rebuild modern airplanes under factory standards. Training also includes aerial radio, welding, instrument repair, etc. Machine shop practice.

### Individual Instruction Methods

assure rapid, more thorough progress. Our instructors and executives give their entire attention to your aeronautical education. For a quarter of a century Lincoln has sent excellently trained men out into the world to win rich rewards. Now in 25th year; 15 years teaching aviation.

**Approved Modern Equipment—**We use only planes which are inspected and approved by the U. S. Department of Commerce. You learn to fly open cockpit biplanes, low wing and high wing monoplanes, small and large transport types of cabin planes for complete experience. Both flight and ground school buildings and facilities are among the finest in America. Both under Government Supervision. High class instructors. Thoroughly equipped buildings.

Thousands of jobs ahead. Start training now at Lincoln for a successful aviation career. Write today. Please state your age.

**LINCOLN AIRPLANE & FLYING SCHOOL**  
205-F Aircraft Bldg., Lincoln, Nebraska



Be an

## ELECTRICAL EXPERT

Learn to Earn  
Big Jobs

No "hard times" in Electricity—the Big Pay Field. Thousands of new Experts needed for present and future activity. Boulder Dam—"TVA"—other government electrical projects soon ready. Start Now. Earn while learning at home. Easy. Low Cost. 100,000 men successfully trained. Write for FREE BOOK. Learn to earn \$35 to \$75 a week.

**L. L. Cooke School of Electricity, Dept. 14, 2150 Lawrence Ave., Chicago**



## "Why VOICE Students Fail"

**SENT FREE No Obligation to Buy**

If you act quick!—we will send postpaid—for 30 days' free reading—now Voice Book disclosing startling VOICE FACTS that may save hundreds of dollars to every man or woman seeking a strong, rich voice for either singing or speaking. 30 days' free reading—then send \$1.00. Otherwise, return it—that's all!

**PROF. E. FEUCHTINGER** Studio 13-54  
64 E. Lake Street Chicago



## High School

You can complete this  
simplified High School

Course at home as rapidly as your time and abilities permit. Many finish in 2 years or less. Course prepares you for entrance to college and advancement in business and industry. Standard H. S. texts supplied. Diploma awarded. Credit for H. S. subjects already completed. Single subjects if desired. Free Bulletin on request.

**American School, Dept. HC-445, Drexel at 58th, Chicago**

## ASK FOR LEPAGE'S

**CASEIN GLUE**  
A real CASEIN GLUE

When writing to advertisers please mention Popular Mechanics



# "Give Me Your Measure and I'll Prove in the First 7 Days You Can Have a Body Like Mine!"

No other Physical Instructor in the World has ever **DARED** make such an offer!

**I**'LL give you **PROOF** in 7 DAYS that I can turn you, too, into a man of might and muscle. Just think of it! Right in the first week under my guidance you will see and feel the improvement! Then as my weekly instructions arrive in your home you continue to re-build, renew and "overhaul" your body. By the end of three months you are the owner of a powerful body that you will be proud to display anywhere, anytime!

People will notice the ruddy glow of health in your face, the sparkle in your clear eyes, your broad shoulders, and they will seek your company. You will be the fellow who will walk off with the prettiest girl and the best job while the others wonder how you did it!

Write your name and address carefully on the coupon below. I'll send you, absolutely free, a copy of my new book, "Everlasting Health and Strength." It reveals the secrets that changed me from a 97-pound flat-chested weakling into a husky fellow who won the title of "The World's Most Perfectly Developed Man" against all comers! And it shows how I can build you into an "Atlas Champion" the same way.

Are you underweight? I'll add pounds where they are needed! Are you fat in spots? I'll show you how to pare down to fighting trim.

And with the big muscles and powerful, evenly-developed body that my method so quickly gives you, I'll also give you through-and-through health—health that digs down into your system and banishes such things as constipation, pimples, skin blotches and the hundred-and-one similar conditions that rob you of the good times and the good things of life.

## I've Got No Use At all for "Contraptions"

I haven't any need for contraptions that may strain your heart and other vital organs. I don't dose you or doctor you. *Dynamic-Tension* is all I need! It's the natural, tested method for developing real men inside and out. It distributes added pounds of powerful muscles over your body, gets rid of surplus fat, and gives you the vitality, strength and pep that win you the admiration of every woman and the respect of any man.

Get my free book, "Everlasting Health and Strength"! Mail my coupon today. Gamble a stamp to prove I can make **YOU** a new man!

**MAIL COUPON FOR FREE BOOK NOW!**

When writing to advertisers please mention *Popular Mechanics*

# FREE

IF YOU MAIL  
COUPON AT ONCE

New Kind of  
**MOVIE**  
Showing  
**CHARLES ATLAS**  
IN ACTION



No cost. No obligation. If you mail coupon below at once you will receive this fascinating "movie show" absolutely **FREE**. As its 60 moving pictures flick before you, the "World's Most Perfectly Developed Man" goes through his paces. Watch his mighty muscles flex. See, with your own eyes, what *Dynamic-Tension* did for him—what it can do for **YOU**, too! Quantity limited. Mail coupon today!

**THIS BIG STERLING  
SILVER CUP  
BEING  
GIVEN  
AWAY**



Stands about 14 in. high, on black mahogany base. I will award it to my pupil who makes the most improvement in his physical development within next three months. Therefore, no matter what your measurements are now, you have equal chance to win this cup to keep—with your name engraved on it!

**48-PAGE BOOK  
FREE**

It tells you all about my special *Dynamic-Tension* method, and what it has done to make big-muscled men out of run-down specimens. It shows you, from actual photos, how I have developed my pupils to the same perfectly balanced proportions of my own physique. What my system did for me and these hundreds of others it can do for you too. Don't keep on being only half of the man you **CAN** be! Find out what I can do for you. Where shall I send your copy of "Everlasting Health and Strength"? Put your name and address on the coupon, or a postcard, and mail it today. **CHARLES ATLAS**, Dept. 8D, 115 E. 23rd St., New York City.



**CHARLES ATLAS, Dept. 8D**  
115 E. 23rd St., New York City

I want the proof that your system of *Dynamic-Tension* will make a New Man of me—give me a healthy, husky body and big muscle development. Send me your free book, "Everlasting Health and Strength,"—also the "new kind of movie," 60 moving pictures showing you in action.

Name.....  
(Please print or write plainly)

Address.....

City..... State.....

© 1936 C.A. Ltd.

NECK  
17 IN.

FOREARM  
14½ IN.

CHEST  
NATURAL  
47 IN.

BICEPS  
17 IN.

WAIST  
32 IN.

THIGH  
23¼ IN.

CALF  
16 IN.

HEIGHT  
5 FT. 10 IN.

WEIGHT  
178 LBS.

**NOTE!** This is the latest photo of Charles Atlas showing how he looks today. This is not a studio picture but an actual untouched snapshot.



# INVENTORS

**T**O be successful as an inventor, you don't need to be an Edison who took out 1099 Patents before he died, or a C. F. Kettering, who helped develop the Self-Starter, Duco, Ethyl Gas and other outstanding inventions, and is today the famous head of the Research Division of the General Motors Corporation. In fact, you don't need to be known as an inventor at all, if you have a practical, useful, salable invention—or an idea for one—and go about it right.

Remember that for every Edison or Kettering, for every McCormick, DeForest or Atwater Kent—there have been thousands of unknown men whose inventions helped along the wheels of progress and helped the inventors financially at the same time.

## MANY LITTLE IDEAS HAVE BIG COMMERCIAL POSSIBILITIES

For example, who knows the name of the inventor of the wooden golf tee, the ordinary crinkly hair pin, or the metal ball or disc that the average housewife uses for scouring pots and pans? Who knows the inventors of the thousands of gadgets that you will find in the ten-cent stores, in the modern drug and department stores? Some day, stop and look at some of the simple articles you'll find on the counters of a ten-cent store. Notice how many of them are marked "Patented or Patent Applied For." It is an interesting, educational experiment. These inventors, most of them, weren't of the genius class. They simply got an idea for doing something in a better, easier, faster, or more economical way—AND THEN DID SOMETHING ABOUT IT.

### Interesting Points

**Who is today's "champion inventor"?**

**Ans:** John F. O'Connor, of Chicago, Ill. holds 949 Patents, more than any other living man.

**Who is "Lady Edison"?**

**Ans:** Miss Beulah Louise Henry of New York City leads all women inventors, holds fifty patents; is known as "Lady Edison."

**What is an Improvement?**

**Ans:** Nearly all inventions today are improvements over earlier inventions. Often the improvement proves more profitable than the earlier invention.

**Is a model necessary?**

**Ans:** Today, most inventions are patented without models. A subject fully explained in our book.

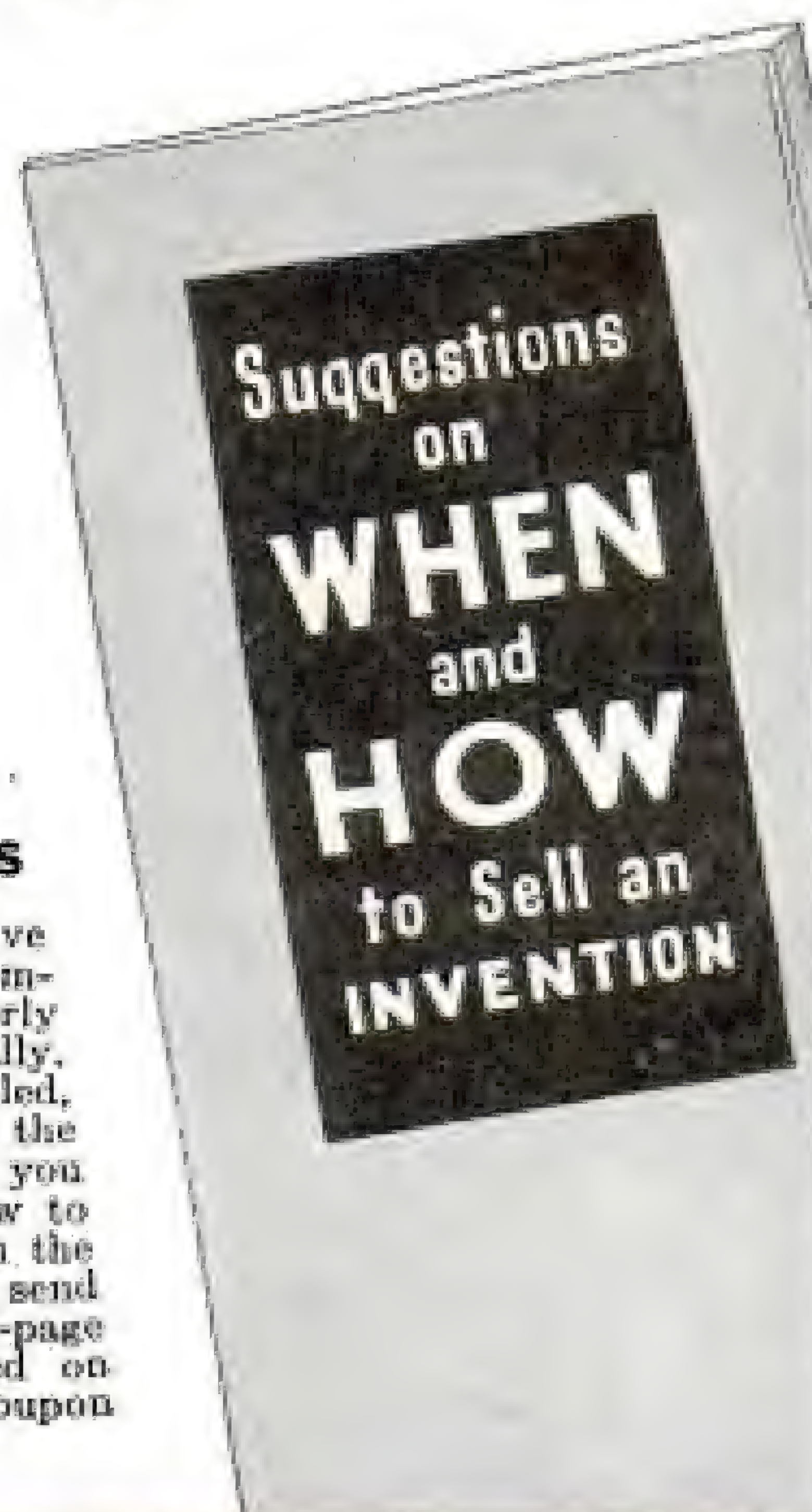
**What is the preliminary search?**

**Ans:** The preliminary search is ordinarily the first step to help an inventor. Also fully explained in our book. Send for a copy today.

You may be able to do as well as others who have been successful. That only time can tell. But there is one thing you can do, and do now, without waiting on time. You can find out easily and quickly exactly what to do to protect yourself. In the 48-page book, "Patent Protection" shown on the opposite page, which will be sent to you FREE, we tell you what many other inventors have done, just what you yourself must do to make Application for a Patent, give you interesting facts about inventive history, show you 115 mechanical movements—that inventors have used in working out ideas, and much more. Decide now to get a copy of this interesting book. Its facts can be worth much—yet they cost you nothing.

### A New Book about Selling Inventions

There are two sides to every inventive success: The inventive side and the commercial side. A good invention poorly handled, can prove a failure commercially. An ordinary invention, properly handled, can be made a money-maker. In the special booklet, shown here, we give you some suggestions on "When and How to Sell an Invention"; practical hints on the commercial side of inventing. We'll send this new booklet along with the big 48-page book, "Patent Protection" illustrated on the next page. Use the convenient coupon to request your copies.



# We Cordially Invite You to . .

*When writing to advertisers please mention Popular Mechanics*



# NOTE ★ ★

**You may not be an Edison or a Kettering but still you may have a good idea**

**YOUR QUESTIONS ANSWERED!** There are a lot of questions that the average man with an invention, or an idea for one, wants answered before he goes ahead. Here are a few of them that most inventors put up to us: How do the Patent Laws protect me? What easy steps can I take, without cost, to put myself in position to support my belief that I am the first man to think of my invention? Is a Patent worth the cost? Should I try to sell my invention before I have it Patented? Is there any

safe, business-like way to secure financial help? If I do apply for a Patent how shall I reach people who can market my invention? Can I protect and sell an improvement on some invention that has already been Patented? These are but a few of the questions which usually confront the average man. **You need the answers! YOU CAN HAVE THEM,** without cost, trouble, or delay.

## **Our Business Is to Help You Write Us Today**

For more than thirty-seven years, this firm has been helping men with an inventive turn of mind. We maintain a large staff of trained, experienced specialists—Registered Patent Attorneys, Draftsmen, and Searchers to help our clients secure all the protection to which they are entitled. Fees are reasonable. Deferred payments frequently arranged. Questions promptly answered. Write us frankly with absolute assurance that what you say will be treated with strictest secrecy. But first send for the **FREE BOOKS** shown on these two pages. They are filled with facts, pictures and suggestions. They tell you things about Patents, Inventions and Selling Inventions that we have learned in our long experience. They may save you time, expense, **EVEN LATER DISAPPOINTMENT.** Simply fill in the coupon or write us a confidential letter. No charge, no obligation. Mail the coupon today.

## **VICTOR J. EVANS & Co.** **REGISTERED PATENT ATTORNEYS**

Main Office: 700-D, Victor Building, Washington, D. C.

Other Offices: 533-N Marquette Bldg., Chicago; 1007-N Woolworth Bldg., New York; 514-N Empire Bldg., Pittsburgh; 1010-N Hobart Bldg., San Francisco; 736-N Security Bldg., Los Angeles.

Send me **FREE** copies of your books "Patent Protection" and "When and How to Sell an Invention." (Note: Same books supplied by any of branch offices listed above.)

Name.....

Street and No.....

City or Town.....

.....

.....

**MAIL THIS  
COUPON TODAY**

*When writing to advertisers please mention Popular Mechanics*



## BE A TRAINED

## AUTO-DIESEL

Expert

GOOD JOBS—

GOOD PAY

EARN AS  
YOU LEARN  
AT HOME

Diesel Power for trucks, buses, tractors, farm power and lighting plants opens rich, new fields of opportunity for Diesel-trained men.

Good jobs, at good pay, await those who prepare NOW to get in on the ground floor of this fast-growing industry. And with combined Auto-Diesel "Job-Way" Training, brought to your home by the pioneer automotive home-study school, you can train for success in this new field without leaving your present position while learning.

**"Job-Way" Training is Practical, Complete, Modern**

Our modern, revised Training covers every new development in the operation and repair of present day gasoline and Diesel automobiles, trucks, tractors, etc. And the same practical, easy-to-learn method that has started thousands of our graduates toward success, will qualify you in a few short months for a better job, or a profitable repair business of your own.

## New Auto-Diesel Course Included at No Extra Cost

Students enrolling now for our regular Automotive courses get our complete new Auto-Diesel course AT NO EXTRA COST. Send Coupon today for details of our "Earn as You Learn" Training plan, backed by fifteen years' success in the automotive training field.

## Earn as You Learn—Two Motor Testers Free

Just now, we are also including complete, valuable motor testing equipment, to assist your training and enable you to begin earning extra spare-time money soon after you enroll.

## AUTO-DIESEL BOOK FREE

Men without previous auto experience or special education quickly master "Job-Way" Training and become skilled experts in every branch of auto work. Mail the coupon today for your FREE AUTO-DIESEL Book and complete facts about Free Employment and Consultation Service. No obligation!

## MOTOR INSTITUTE OF AMERICA

4554 Broadway, Dept. DD-11, Chicago

## MOTOR INSTITUTE OF AMERICA

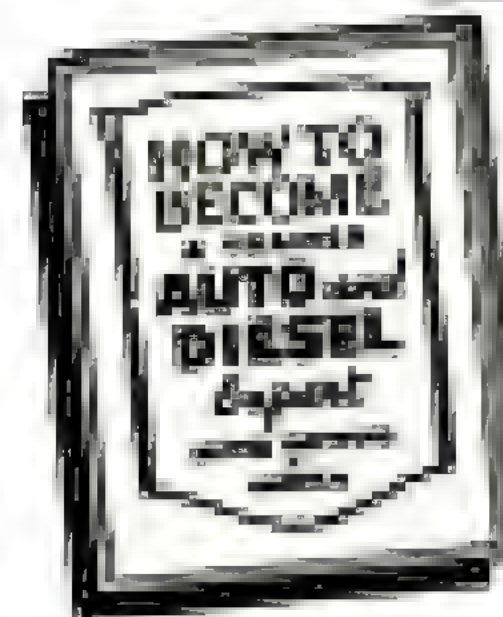
4554 Broadway, Dept. DD-11, Chicago, Ill.

Without obligating me, send Free Auto-Diesel Book with all facts about "Job-Way" Home Training and Special Offer.

Name.....

Address.....

City..... State.....

MAIL  
COUPON  
FOR  
FREE  
BOOK

## MECHANICAL ENGINEERING

Pays Big  
NOW!

Less than 20 minutes a day with these 7 big mechanical engineering books will prepare you for a better job and bigger pay. Machine hands become foremen and super-intendents, helpers become experts, foremen become managers. Any machinist, helper or factory employee can benefit QUICKLY and put himself in a position to demand more money.

## Your Opportunity

Don't miss this chance to qualify for promotion, don't put off for one minute this Big Opportunity which is yours almost for the asking. Seven Big Books chockful of every known mechanical fact, told so simply and clearly that any one can understand them. Over 2600 pages, nearly 2700 illustrations cover every subject fully, including Tool Making, Pattern Making, Foundry Work, Mechanical Drawing, Forging, in fact anything you need to know.

## Everything Sent FREE

for examination. Yes ALL of these books will be sent to you for examination. Decide in your own home or place of business whether or not you want to keep them, check up on any facts you want to. Note their great MONEY MAKING value, then, if you want them, pay on the easiest kind of payments.

FREE

Complete set of drawing instruments if you send for these books NOW. These instruments are made of the finest of German silver, are absolutely accurate and are packed in velvet lined leatherette pocket case. Real \$10 value but free to you with these books.

American Technical Society, Dept. M-479, Grand at 58th St., Chicago

You may send me the 7 big NEW books for free examination. I will pay the few cents delivery charges only unless I decide to keep them in which case I will send \$2.00 in ten days and \$3.00 per month until the total price of only \$28.00 is paid. If I return them in 10 days I will owe you nothing. Because I send now, you agree to give me a membership in the American Technical Society entitling me to Free consultation privileges with any of your experts for one year and set of drawing instruments.

Name.....

Address.....

Please attach a letter stating age, occupation, employer's name and address and that of at least one business man as reference.

When writing to advertisers please mention Popular Mechanics

It's Easy to  
PLAY GUITAR

## FREE Gibson BOOK

You learn quickly on newest Gibson models, choice of leading professionals. Rich tone wins instant admiration. Be popular, make more money—with a Gibson Guitar, Banjo or Mandolin. **FREE TRIAL, EASY PAYMENTS.** Write today for details—and copy of **Free Book**, packed with valuable facts. Mention instrument. No obligation.



GIBSON, INC., 404 Parsons St., Kalamazoo, Mich.

## Be a DENTICIAN



Learn at home to make Crowns, Plates, Bridgework, etc., for Dentists. Easy, practical way to learn mechanical dentistry at home in spare time. Full Equipment of Tools and Materials Included with Course. Low tuition. Easy terms. Write for **FREE BOOK** about this money-making profession that is not affected by "machine age."

McGARRIE SCHOOL  
OF MECHANICAL DENTISTRY

207 N. Broad St., Dept. 708 Philadelphia, Pa.

Learn Public  
Speaking

At home—in spare time. Many overcome "stage-fright," gain self-confidence, and increase their earning power, through ability to sway others by effective speech. Write for free booklet, *How to Work Wonders With Words* and requirements.

NORTH AMERICAN INSTITUTE, Dept. 1354  
3601 Michigan Avenue Chicago, IllinoisCARTOON YOUR WAY  
TO SUCCESS!

DON'T COPY—LEARN TO ORIGINATE!

RAYE BURNS will teach you HOW to CREATE ORIGINAL CARTOONS at home that you can SELL! Course contains 26 lessons and over 600 illustrations. All for Only . . .

\$2.85

Send name and address for free details.

RAYE BURNS SCHOOL, Dept. M-X, BOX 2194, Cleveland, Ohio

Learn  
PHOTOGRAPHY  
at Home

Splendid opportunities. Prepare in spare time. Easy plan. No previous experience needed, common school education sufficient. Send for free booklet "Opportunities in Photography", particulars and requirements.

American School of Photography  
3601 Michigan Ave., Dept. 1354, Chicago, Ill.Correspondence Courses in  
RADIO and ELECTRICAL ENGINEERINGSPECIAL  
Only

\$25

ELECTRICAL ENGINEERING covers complete electrical field. Most modern courses. Very understandable. RADIO ENGINEERING. Ultra-modern course in radio, public address, photo-electric work. Trains you to be super-service man, real vacuum tube technician. Tuition ONLY \$25, either course. Delayed payment plan. WRITE TODAY for free copies of school catalog, student magazine, etc.

LINCOLN ENGINEERING SCHOOL

554-R So. 37th St., Lincoln, Neb.

WHAT IS THIS  
STRANGE FORCE

—the thinking mind?

You begin to LIVE when you learn to heed this inner mind, awakening your natural thought forces. For centuries the Rosicrucians have collected and guarded basic facts on successful living; truths which guide one's path through life. For free booklet, explaining how to acquire this knowledge, write Scribe: R. N. S.

THE ROSICRUCIANS, AMORC, San Jose, Cal.





# Skinny, Weak, Nervous Rundown Ailing?

**How NATURAL IODINE  
Builds Worn-Out, Pale,  
Sickly Folks Into Strong,  
Red Blooded Men and  
Women . . .**

Kelpamalt, New Mineral Concentrate From the Sea, Rich in NATURAL PLANT IODINE, Feeds Starved Glands — Must Build Rich Red Blood, Put on Lbs. of Solid, "Stay-There" Flesh, Give Steady Nerves and Day-long Energy in First Week or Trial is Free!

Here's new hope and encouragement for thousands of weak, worn-out, haggard-looking men and women even naturally skinny, whose energy and strength have been sapped by overwork and worry, who are nervous, irritable, always half sick and ailing. Science says the principal cause of these rundown conditions is "GLANDS STARVING FOR IODINE." When these glands don't work properly, all the food in the world can't help you. It just isn't turned into flesh. The result is you stay skinny, pale, tired-out and run-down.

The most important gland—the one which actually controls body weight and strength—needs a definite ration of iodine all the time—NATURAL ASSIMILABLE IODINE—not to be confused with chemical iodides which often prove toxic. But the same iodine that is found in tiny quantities in spinach and lettuce. Only when the system gets an adequate supply of iodine can you regulate metabolism—the body's process of converting digested food into firm flesh, new strength and energy.



To get NATURAL IODINE in convenient, concentrated and assimilable form, take Kelpamalt—now recognized as the world's richest source of this precious substance. It contains 1,300 times more iodine than oysters, once considered the best source. Six tablets alone contain more NATURAL IODINE than 486 lbs. of spinach or 1,387 lbs. of lettuce.

Try Kelpamalt for a single week and notice the difference. See flattering extra pounds of "stay-there" flesh appear in place of scrawny hollows. Notice how much better you feel, and if you don't gain at least 5 lbs. in one week the trial is free. 100 jumbo size Kelpamalt tablets—four to five times the size of ordinary tablets—cost but a few cents a day to use. Get Kelpamalt today. Kelpamalt costs but little at all good drug stores. If your dealer has not yet received

his supply, send \$1.00 for special introductory size bottle of 65 tablets to the address below.

"Manufacturers note: Inferior products sold as Kelp and malt preparations—in imitation of the genuine Kelpamalt—are being offered as substitutes. The Kelpamalt Company will pay for information covering any case where an imitation product has been represented as the original Seedol Kelpamalt. Don't be fooled! Demand genuine Seedol Kelpamalt tablets. They are easily assimilated, do not upset stomach nor injure teeth. Results guaranteed or money back."

## Comparison of Minerals in KELPAMALT vs. VEGETABLES

### 3 Kelpamalt Tablets Contain:

1. More Iron and Copper than 1 lb. of spinach, 7 1/4 lbs. fresh tomatoes, 3 lbs. of asparagus.
2. More Calcium than 1 lb. of cabbage.
3. More Phosphorus than 1 1/4 lbs. of carrots.
4. More Sulphur than 2 lbs. of tomatoes.
5. More Sodium than 3 lbs. of turnips.
6. More Potassium than 6 lbs. of beans.
7. More Magnesium than 1 lb. of celery.

**SEEDOL**  
**Kelpamalt Tablets**

## SPECIAL FREE OFFER

Write today for fascinating instructive 50-page book on How to Add Weight Quickly. Mineral Contents of Food and their effect on the human body. New facts about NATURAL IODINE. Standard weight and measurements charts. Daily menus for weight building. Absolutely free. No obligation. Kelpamalt Co., Dept. 750, 27-35 West 29th St., New York City.

NAME .....

ST. .... CITY .....

When writing to advertisers please mention Popular Mechanics



# PATENTS

## DELAYS ARE DANGEROUS IN PATENT MATTERS

The Free Book shown here was prepared for inventors, to show them exactly what steps they must take to secure a PATENT. If you have an idea, you should send for this book AT ONCE. It will tell you exactly how an application for a Patent is made, what information you must furnish your attorney, and what steps he must take in order to protect your interests. Remember, inventing an article is one thing—securing the exclusive right to manufacture it, use it or sell it is another. Without a U. S. Patent, you cannot expect to reap the profits that your invention may make possible. Send at once for this book. After you get that, you'll know exactly what to do to protect yourself.

### Small Ideas May Have Large Commercial Possibilities

Ideas do not have to be complicated to be profitable when Patented. The 5c and 10c stores flourish on simple Patented products which are commercially successful. The zipper, safety pin, thumb tack, paper clip, collar button—all are simple yet familiar inventions—brought their inventors rich rewards. If you have a Patentable idea—act to protect it. Send for our FREE 48-Page Book that tells you how.



A partial view of our drafting and specification offices where a large staff of experienced experts is in our constant employ.



### WE SERVE YOU QUICKLY AND SECRETLY

Anything you write us or send us is strictly confidential between us. All letters and drawings are kept in strong, steel, fireproof files, which are open only to ourselves or authorized members of our staff. We have secured patents for inventors located in every state in the Union. Our organization is a large and efficient one. Our practice is confined entirely to Patents, Trade-Marks and Copyrights. We have had years of experience in Patent Matters. When you place your idea in our hands, we are in position to proceed at once to secure protection for you. Our fees are reasonable, and, if you desire, we can arrange convenient terms of payment.

### IMPORTANT!

Please understand that you are not under the slightest obligation in sending for this book. We will mail it, together with the Record of Invention form, the same day we receive your request. Use the coupon on next page to save yourself time and trouble. After that, you will be in position to proceed or not as you choose, to make your application for a patent.

## CLARENCE A. O'BRIEN & Hyman Berman

70-M Adams Building

Washington, D.C.

REGISTERED PATENT ATTORNEYS  
BEFORE U.S. PATENT OFFICE



# RECORD OF INVENTION BLANK

# Free

We will send you our Record of Invention form FREE. This blank will enable you to make a sketch of your idea in proper form and have it witnessed in such manner that it may be of value to you as evidence should the occasion for evidence arise. In our book, we tell you how to use this form to protect your interests.

## YOU CAN PATENT

**NEW IDEAS FOR IMPROVEMENTS IN MACHINERY, ARTICLES, DESIGNS, FORMULAS, ETC.**

Every year thousands of Patents are granted. Very few, however, represent the discovery of entirely new principles. Most of them provide new methods of doing some everyday thing in a better way—changes for greater efficiency, usefulness, adaptability, or beauty in some previously Patented thing. These IMPROVEMENTS are Patentable if new, and actually represent new invention. These improvement Patents offer large chances for profit if commercially useful. The business world wants improved products and services.

### OUR LOCATION IN WASHINGTON

Our offices in Washington are convenient to the Patent Office, and we and our assistants can, therefore, appear promptly before the officials and Examiners.

### REASONABLE FEES AND CONVENIENT TERMS

We have served thousands of inventors in all parts of the United States and we are able to serve you very reasonably and extend liberal terms of payment. So don't waste valuable time.

AND THIS

# Free BOOK

**TELLS HOW!**

How your Patent Application is made; what kind of sketches or drawings are necessary; what other papers must be made out; how the Patent Laws protect you; why it is important to avoid loss of time in getting your application filed; and many other important points. Even a very simple idea, if new and useful, may prove very valuable. You may have much to gain and nothing to lose by sending for this book TODAY.

*Mail  
Coupon  
NOW*

## CLARENCE A. O'BRIEN & Hyman Berman

70-M Adams Building

**WASHINGTON, D.C.**  
REGISTERED PATENT ATTORNEYS  
BEFORE U.S. PATENT OFFICE

Please send me your FREE BOOK, "Patent Guide for the Inventor" and your "Record of Invention" form, without any cost or obligation on my part.

NAME.....

ADDRESS.....

(Important: Write or print name plainly.)







**"IF YOU DO NOT ADD AT LEAST 3 INCHES To Your CHEST IT WON'T COST YOU ONE CENT!"**

—Signed: GEORGE F. JOWETT

**THREE SOLID INCHES** of muscles added to your chest and at least two inches added to each of your biceps, or it won't cost you a penny. I know what I am talking about. . . . I wouldn't dare make this startling agreement if I wasn't sure I could do it.

All I want is a chance to prove it! Those skinny fellows who are discouraged are the men I want to work with. I'll show them how to build a strong man's body. . . . and do it quickly. And I don't mean cream-puff muscles either. Wouldn't you, too, like to get a he-man's chest like the idealized figure above? I will show you how to get real, genuine invincible muscles that will make your men friends respect you and women admire you!

So many of my pupils have gained tremendous development that I am willing to stake my reputation that you can do the same. . . . REMEMBER. . . . If I fail it will cost you nothing!

Send for "MOULDING A MIGHTY CHEST"  
A SPECIAL COURSE FOR ONLY 25c

I will not limit you to the chest; develop any part or all of your body. Try any one of my test courses listed below at 25c. Or try all six of them for only \$1.00. You can't make a mistake. The assurance of the strongest armed man in the world stands behind these courses.

RUSH THE COUPON TODAY AND I  
WILL INCLUDE A FREE COPY OF  
"Nerves of Steel, Muscles Like Iron."

It is a priceless book to the strength fan and muscle builder. Full of pictures of marvelous bodied men who tell you decisively how you can build symmetry and strength the Jowett way! Reach out—grasp this Special Offer!



**FREE BOOK WITH PHOTOS OF FAMOUS STRONG MEN**



GEORGE F. JOWETT  
"Champion of Champions"

Winner of many contests for strength and physical perfection!

**JOWETT INSTITUTE OF PHYSICAL CULTURE**

Dept. 4Dd, 422 Poplar St.,  
Scranton, Pa.

George F. Jowett: Send, by return mail, prepaid, the courses checked below for which I am enclosing . . . . .

- ☐ Moulding a Mighty Arm, 25c
- ☐ Moulding a Mighty Back, 25c
- ☐ Moulding a Mighty Grip, 25c
- ☐ Moulding a Mighty Chest, 25c
- ☐ Moulding Mighty Legs, 25c
- ☐ Strong Man Stunts Made Easy, 25c
- ☐ All 6 Books for \$1.00

Name . . . . . Age . . . . .

Address . . . . .

When writing to advertisers please mention Popular Mechanics

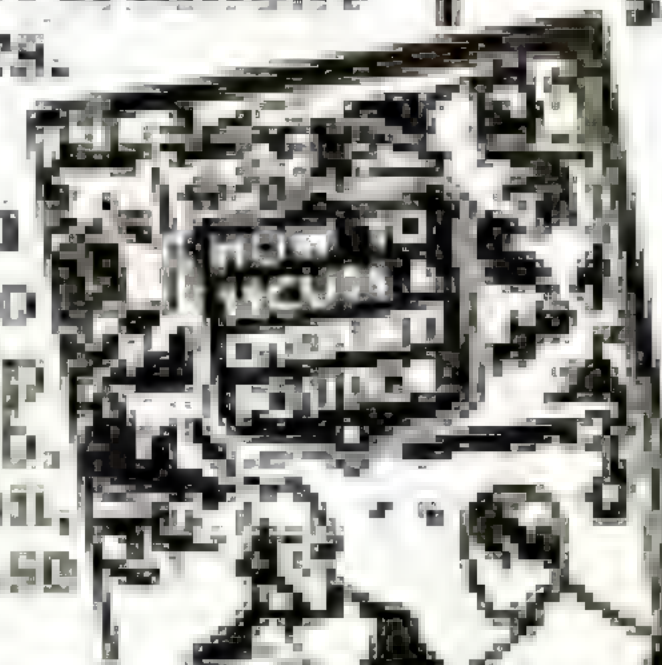
# U.S. GOV'T JOBS

**SHORT HOURS-GOOD PAY  
-VACATIONS-PENSIONS**

Stop worrying about strikes, layoffs, hard times! Get on the government payroll. Pay as high as \$90 a week! Short hours; steady work; vacations. Open to men and women 18 to 50. Let me help you. I train you at home in spare time. I was government Civil Service Examiner for 8 years.

**SEND FOR FREE BOOK**

It tells all about opportunities in the government service; what to do to get job you want; how I help to qualify you for government job. Write NOW to Arthur R. Patterson, PATTERSON SCHOOL, 84 Case Bldg., Rochester, N. Y.



**RAILWAY  
POSTAL CLERK**  
\$1850 to \$2700 a Year  
**CUSTOM HOUSE  
POSITIONS**  
\$1100, \$1680 to  
\$3000 a Year  
**RURAL MAIL  
CARRIER**  
Start at  
\$2100 a Yr.

**POST  
OFFICE  
CLERK**  
\$1700 to  
\$2100 a Year  
**POST-  
MASTER**  
\$1200 to  
\$2500 a Year

## BE A PILOT — FLY A SHIP

If you are stumped at the high cost of training to qualify for a license and a good future in Aviation, write, enclosing stamp, for information on our

**APPRENTICE PLAN**

Mechanix Universal Aviation Service, Inc.  
Strathmoor Sta. Dept. E. Detroit, Mich.

## LEARN WATCH REPAIRING



**AT HOME** You can learn by our modern and original system of instruction every part of the Watch Repairing Trade at home. You can earn money while learning and prepare yourself for a well paying position or start in business after completing our course of instruction. Good watch repairers are in demand and generally earn very good salaries. For particulars apply to the  
**Wisconsin School of Watch Repairing**  
524 E. Mason St., MILWAUKEE, WIS.

## Finish High School at Home

You can complete this simplified High School Course at home as rapidly as your time and abilities permit. Many finish in 2 years or less. Course prepares you for entrance to college. Standard H. S. texts supplied. Diploma awarded. Credit for H. S. subjects already completed. Single subjects if desired. Free Bulletin on request.  
**American School, Dept. HB-445, Drexel at 58th, Chicago**

## THE A B C OF THE HEAVENS

a primer-atlas of the stars for the common man, by Dr. Ralph B. Larkin. Maps large, simple, clear. Illuminating descriptive text. Delight of star-lovers. Second printing. \$1.00 postpaid.  
**ALCYONE PRESS, 2214A Los Angeles Ave., BERKELEY, CALIF.**

## LEARN RADIO \$100 Per LESSON

**MANY MEN NEEDED** No notes to sign. Start and stop as you please. Interesting, revolutionary, successful, individual method. Equipment loaned and rented. University expert instructors and experienced specialists. Free information or send only \$1.00 for first lesson.  
**MISSOURI TECHNICAL SCHOOL, 3907-A, N. 28th, ST. LOUIS, MO.**

## Learn ADVERTISING at Home

Greater opportunities now in advertising. Learn easily and quickly in spare time. Practical work. No text books. Old established school. Low tuition—Easy terms. Send for free booklet of interesting information.  
**Page-Davis School of Advertising**  
Dept. 1354, 3601 Mich. Ave., Chicago



**Minstrels**

Unique First Parts for complete show with special songs and choruses. Make-up. Catalog Free.

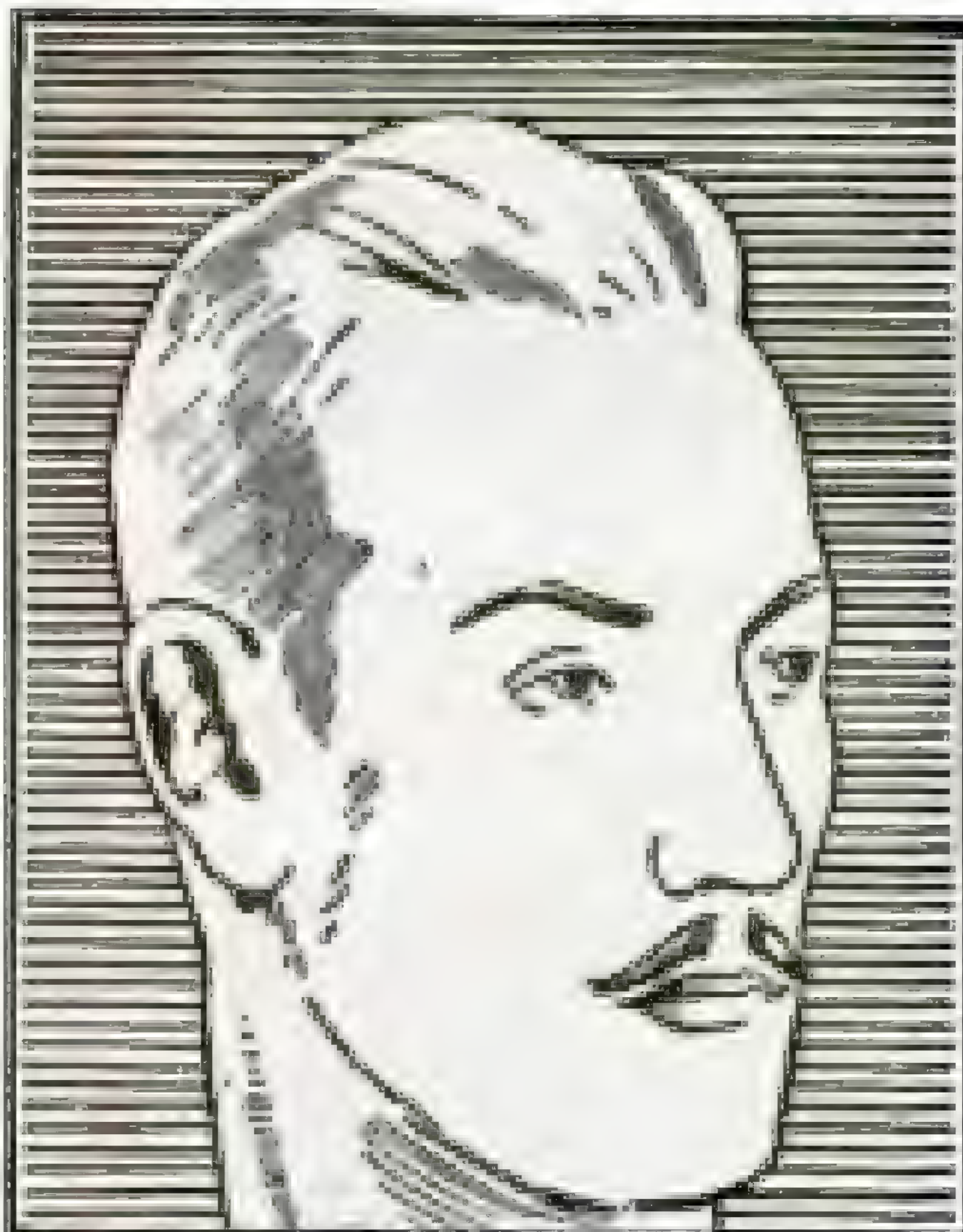
T. S. Denison & Co., 623 S. Wabash, Dept. 19 Chicago



## MAKE GLAZED GARDEN POTTERY

Beautiful, colored, glazed concrete pottery made without molds. No experience needed. Use only sand and cement. 2,500 different designs birdbaths, vases, jars, etc. Big profits. Send 10c for Booklet, color plate, etc.  
**NATIONAL POTTERIES CO., 424 Second Ave., So., Room 21, Minneapolis, Minn.**





DON CORRADO ROMANO  
*founder of*  
**ROMANO'S**  
COIN SHOP

# OLD MONEY WANTED

*We Pay The World's Highest Prices*

UP TO **\$5000.00** EACH

**Amazing Profits  
For Those Who Know  
OLD MONEY!**

**Big Cash Premiums  
FOR HUNDREDS OF COINS  
NOW CIRCULATING**

will pay big cash premiums. Many of these coins are now passing from hand to hand in circulation. Today or tomorrow a valuable coin may come into your possession. Watch your change. Know what to look for. Don't sell your coins, encased postage stamps, or paper money to any other dealer until you have first seen the prices that we will pay for them.

## WE WILL PAY FOR 1909 CENTS UP TO \$10.00 EACH

1860 Cents \$50.00 — Cents of 1861, 1864, 1865, 1869, 1870, 1881, 1890, \$20.00 each—Half Cents \$250.00—Large Copper Cents \$2000.00—Flying Eagle Cents \$20.00—Half Dimes \$150.00—20c Pieces \$100.00—25c before 1873, \$300.00—50c before 1879, \$750.00—Silver Dollars before 1874, \$2500.00—Trade Dollars \$250.00—Gold Dollars \$1000.00—\$2.50 Gold Pieces before 1876, \$600.00—\$3 Gold Pieces \$1000.00—\$5 Gold Pieces before 1888, \$5000.00—\$10 Gold Pieces before 1908, \$150.00—Commemorative Half Dollars \$6.00—Commemorative Gold Coins \$115.00.

**PAPER MONEY**—Fractional Currency \$26.00. Confederate Bills \$15.00. Encased Postage Stamps \$12.00.

**FOREIGN COINS**—Certain Copper or Silver Coins \$15.00. Gold Coins \$150.00, etc. Don't Wait! Send Dime Today for Our Large Illustrated List Before Sending Coins

Address your envelope to:

**ROMANO'S COIN SHOP**  
Dept. 578 Springfield, Mass.

**CUT FILL OUT AND MAIL TODAY!**

**ROMANO'S COIN SHOP, Dept. 578**  
Springfield, Mass.

Gentlemen: Please send me your large illustrated list for which I enclose 10c in cash carefully wrapped. (Please print plainly.)

NAME \_\_\_\_\_

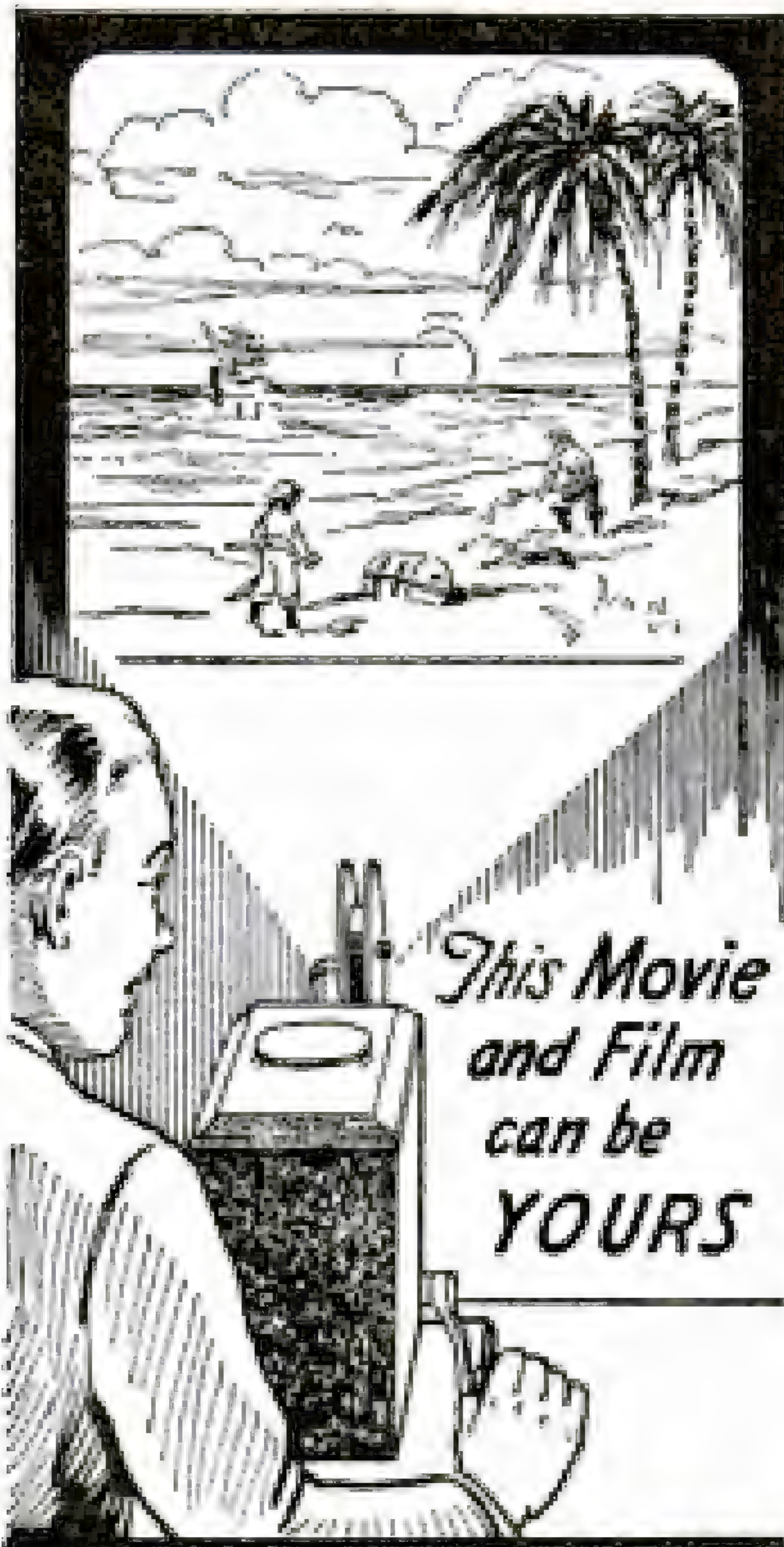
ADDRESS \_\_\_\_\_

CITY \_\_\_\_\_ STATE \_\_\_\_\_

When writing to advertisers please mention Popular Mechanics



# GET THESE PRIZES *-and* MAKE MONEY!



**BOYS**—12 to 16—here's a big opportunity for you! Get this flashy deluxe bicycle or your choice of 300 other prizes, including a movie machine. Bike comes fully equipped, chromium-plated; baked-on enamel. Built for speed and long wear.

Besides these prizes, you can earn **MONEY**. It's easy. Just deliver our fine magazines to people in your neighborhood. Need not interfere with school or play. Mail the coupon and we'll start you. Many boys earn a prize the very first day; perhaps you can, too! Act without delay.

**Mail This Coupon at Once**

Mr. Jim Thayer, Dept. 597  
The Crowell Publishing Co.  
Springfield, Ohio

Dear Jim: I want to earn **MONEY** and **PRIZES** by delivering magazines in my neighborhood. Start me and send me a Prize Book.

Name.....Age.....

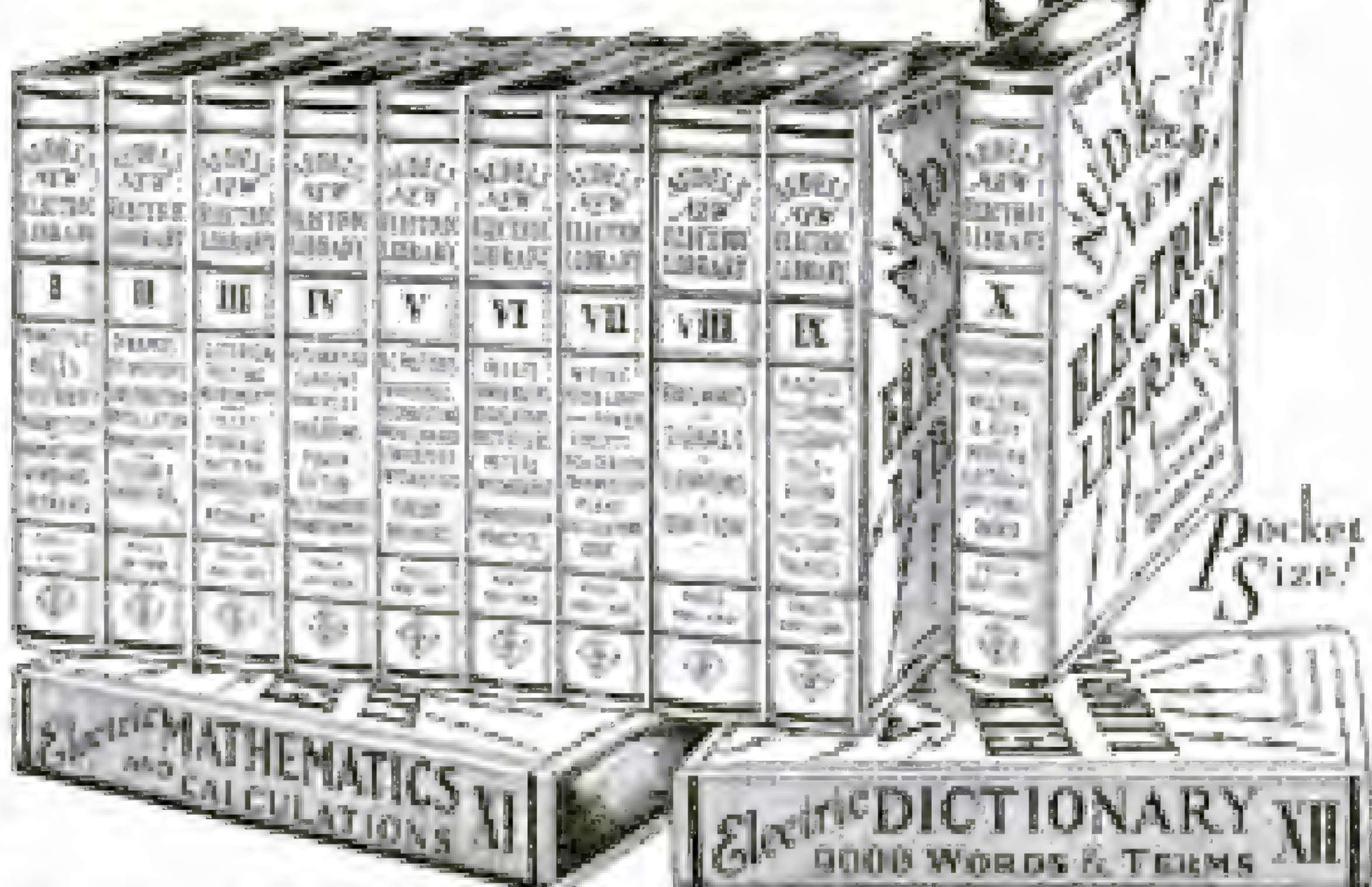
Address.....

City.....State.....



## NEW ELECTRIC LIBRARY

**\$ 1.50 A VOLUME**



### WHAT EVERY ELECTRICIAN WANTS TO KNOW!

is easily found in AUDEL'S NEW ELECTRIC LIBRARY. Electricity made simple as ABC. Up-to-date, trade dope for the expert and ALL electrical workers.

Questions, answers, diagrams, calculations, underwriter's code; design, construction, operation and maintenance of modern electrical machines and appliances **FULLY COVERED**.

All available at small cost, easy terms. **BOOK-A-MONTH** service puts this NEW information in your hands for 6c a day. You can start your subscription with any volume. Write **TODAY** for electric Folder and **FREE TRIAL** offer.

**THEO. AUDEL & CO., 65 W. 23rd St., New York City**

Mail Vol. I, Electric Library on 7 days' free trial. If O. K., I will remit \$1.50, otherwise I will return it. I also request you to mail one book each month on same terms. No obligation unless I am satisfied.

Name.....

Address.....

Occupation.....

## MAKE MONEY NOW

Have your own profitable business, repairing fountain pens. You can repair pens quickly and easily at home. You can charge less than the pen factories and still make a high profit, even on guaranteed pens. Many faulty pens need only adjusting. For \$1 we will teach you to repair all makes of pens and show you how to find your customers. We can supply any parts needed. Send your dollar today for the **COMPLETE "Penman's Manual"** and business-building methods. Money back if not satisfied.

**CHICAGO FOUNTAIN PEN SERVICE** 201 N. Wells St.  
Dept. C-4, Chicago

## Be a High School Graduate

You can complete this simplified High School Course at home as rapidly as your time and abilities permit. Many finish in 2 years or less. Course prepares you for entrance to college. Standard H. S. texts supplied. Diploma awarded. Credit for H. S. subjects already completed. Single subjects if desired. Free Bulletin on request.

**American School, Dept. HA-445, Drexel at 58th, Chicago**

## NERVE TROUBLES

Do symptoms of Constipation, Indigestion, Dizzy Spells, Sweating and Sleeplessness keep you irritable, exhausted and gloomy? Medicines, tonics or drugs probably will not relieve your weak, sick nerves. My wonderful book "Watch Your Nerves", explains a new method that will help you regain healthy nerves. Send 25c to **ROBERT HOLMES, 24 Feller Bldg., Jersey City, N. J.**

## OH BOYS—GIRLS GREAT SPORT THROW Your VOICE



with **CLAXOPHONE** under the table, back of a door, into a trunk, desk in school, any old place. Big FUN for Paddlers, Policemen, Friends. Claxophone lays on your tongue unseen, always ready to use by anyone. Int. Birds, etc. Claxophone with full instructions, a set of Secret Writing Tricks, also Magic Dial Trick, all for 10c, 5 for 25c.



**CLAXO TRICK CO., Dept. 84, New Haven, Conn.**

When writing to advertisers please mention Popular Mechanics



# Raise Giant Frogs

***We Buy What You Raise***



"Nufond Giants"  
weigh up to  
3 pounds.

## Start In Your Backyard

A small backyard pond 20x25 feet with a little bank space is all you need to start. The pond is very shallow; little water is needed. Expand with the off-spring.

Any kind of drinking water is suitable. Running water is not required. Flowers, lilies and plants make the pond very attractive.



A model backyard frog pond

## Good Profits—No Competition

Each pair of "Nufond Giant" breeders lay 10,000 eggs every year. With modern methods, up to 90% turn into frogs.

We pay you up to \$5.00 per dozen for "Nufond Giants". Think of the profit possibilities! Competition is unknown because the wild supply is diminishing.



10,000 Eggs from Each Pair

## Any Climate Suitable

"Nufond Giants" are a hardy breed of "North American" bull-frogs. You can raise them in the North or South, even in Canada.

## Costs Little to Start

A frog pond is easy to make. There is nothing to buy except fence! You even raise the food right in the pond with the frogs! What other livestock offers you such advantages?

## MARKET WAITING



As originators of canned frog legs, we are developing the largest market for frogs in the world. Our products are on sale in principal cities throughout the country.

**WRITE** for our big, illustrated frog book. It explains our money-making proposition in detail.

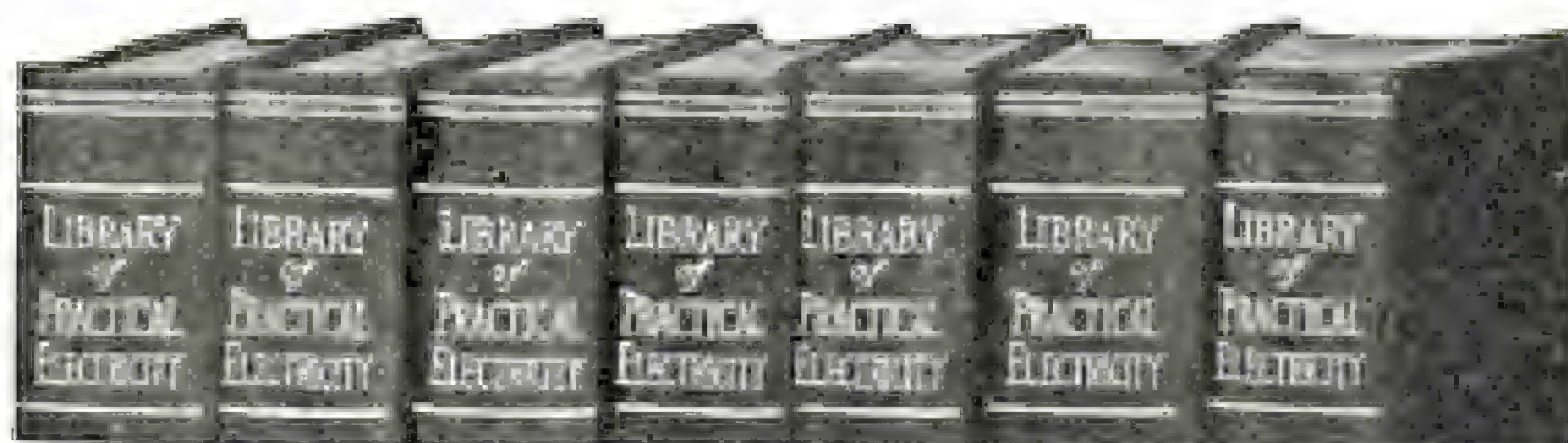
**AMERICAN FROG CANNING COMPANY**  
Dept. 133-D New Orleans, Louisiana

**THIS IS THE  
BEST TIME  
TO START**

**FREE  
BOOK**







## Know Electricity as Experts Know It—and Get an Expert's Pay!

Recovery has begun! The months ahead are charged with splendour and expectation. What will you do to get the jump on the other fellow? Thousands of men have used

### The Croft Library of Practical Electricity

The Croft Library is a complete electrical educator. It is founded on practice—on 20 years of shirt-sleeve experience—on work as it is actually done. It is jammed from cover to cover with the kind of hard-headed facts you want. Written so that the beginner can easily understand it, yet so sound, so thorough, that it is the daily guide of 50,000 highly paid electrical workers and engineers. Croft tells you the things you need to know about motors, generators, armatures, commutators, transformers, circuits, switchboards, distribution systems—electrical machinery of every type—wiring for light and power—wiring of finished buildings—underwriters' and municipal requirements—Illumination in its every phase—the most improved methods of lighting—lamps and lamp effects, etc.—how to do a complete job, from estimating it, to completion.

### No money down—easy payments

Fill in and mail the coupon attached and we will send you the entire set of seven volumes for ten days' Free Examination. We take all the risk—you assume no obligation. If you decide to keep the books, send \$1.50 in ten days and the balance at the rate of \$2.00 a month. Send the coupon NOW and see the books for yourself.

### FREE EXAMINATION COUPON

McGraw-Hill Book Co., 330 W. 42nd St., New York

Send me for ten days' free examination the Croft Library of Practical Electricity. If satisfactory I will send you \$1.50 in 10 days and \$2.00 monthly until the price of \$19.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name.....  
Home Address.....  
City and State.....  
Position.....  
Name of Company..... PM-4-38

**Be a Civil Engineer!**  
Learn—Quick Reference Way

**It's Paying Big Right NOW**



### Cyclopedia of Civil Engineering

7 great volumes.  
2,800 pages.  
1,600 illustrations.  
New revised edition by twelve of America's greatest engineers.

Includes: Surveying, bridges, railroads, steel structures, municipal engineering, water supply, road building, etc.  
Spanish Grain Flexible Covers Gold Stamped

**Shipped Free!**



**Slide Rule**

Be prompt and we will include a brand new, circular slide rule to carry in your pocket. Invaluable in solving all kinds of problems.

**Earn \$3000 a Year—and Up!** with these books

"Civil engineers are wanted NOW. Enormous amounts are being spent in all kinds of public works and not a dime is spent until the Engineer has prepared plans. Then he must direct the work. It's a big job and there are not enough men to go around. Everywhere you go, you see road work going on—water and sewer systems being built—vast projects of all kinds. Here is Your Opportunity to get the necessary training right at home. These books are complete and simply written so anyone can understand them. Start now on our FREE examination plan. Mail the coupon without obligation.

**American Technical Society**  
Dept. C419, Drexel at 58th St., Chicago

**American Technical Society**  
Drexel at 58th St., Dept. C419, Chicago  
I want to examine the CIVIL ENGINEERING Cyclopedia for 10 days FREE. I will gladly pay the few cents express, but I am to pay nothing for the 7 big volumes if I return them within 10 days. If I wish to keep them I will send you \$2 after the 10 days, then \$3 a month until special advertising price \$29.50 is paid. Send latest Edition and Slide Rule.

Name.....

Address.....  
(Attach letter stating age, occupation, employer's name and address and that of at least one business man as reference.)

When writing to advertisers please mention Popular Mechanics

# EASY to play

With an easy playing Conn band instrument, you can be ready for band or orchestra in 4 to 6 weeks. A sure road to popularity if you start on a Conn. Choice of the world's greatest artists. Magnificent tone. Many exclusive features—yet they cost no more.

Ask to see the marvelous new models now being displayed by Conn dealers.

## WRITE FOR THIS NEW FREE BOOK

Home trial. Easy payments. Write us for free book on whichever instrument interests you most. Mention instrument.

C. G. CONN, LTD., 431 CONN BLDG., ELKHART, IND.

# CONN

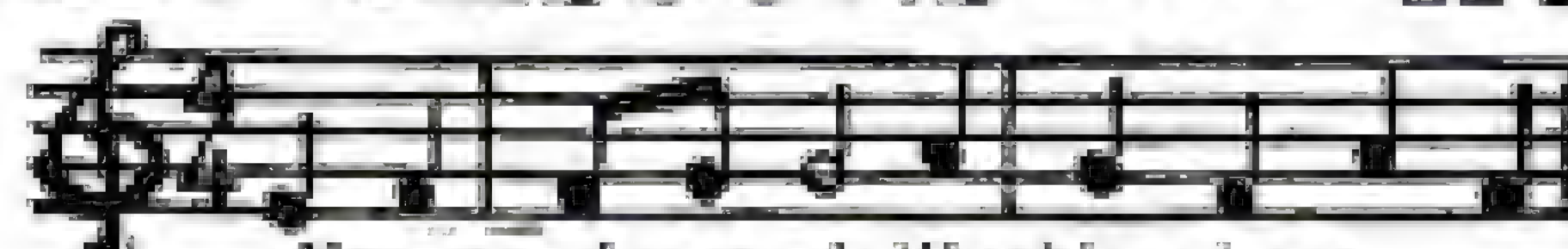
BAND INSTRUMENTS

## BE A CARTOONIST

AT HOME IN YOUR SPARE TIME under supervision of NORMAN MARSH, creator of the famous comic strip "DAN DUNN, SECRET OPERATIVE 48," appearing in the big newspapers. Success—same—real money may be yours when you learn the easy simple methods and secrets which make the MARSH cartoons so successful. Send name for free details of this personal course. Act Today!

**MARSH CARTOON SCHOOL**  
Chicago Daily News Bldg., Dept. 4-1, Chicago, Ill.

## MUSIC LESSONS IN YOUR HOME



You can play music like this quickly Write today for our FREE BOOKLET AND DEMONSTRATION LESSON. It tells how to learn to play Piano, Organ, Violin, Mandolin, Guitar, Banjo, etc. Beginners or advanced players. You pay as you learn. Low cost. Easy terms. Thousands of satisfied students.

**AMERICAN SCHOOL OF MUSIC** Dept. 57, 9430 Eberhart Ave. CHICAGO

## Government Jobs

EXAMINATIONS SOON  
COLUMBIAN CORRESPONDENCE COLLEGE,  
WASHINGTON, D. C.

## SHIP MODELS

Get this dandy casting of true-scale models of Flying Cloud, Viking, Blue Nose, Tally-ho Coach, deluxe fittings. Send 15c (in coin) for your copy.

**ROY HANCOCK**, 323 Douglas Ave., Portsmouth, Virginia

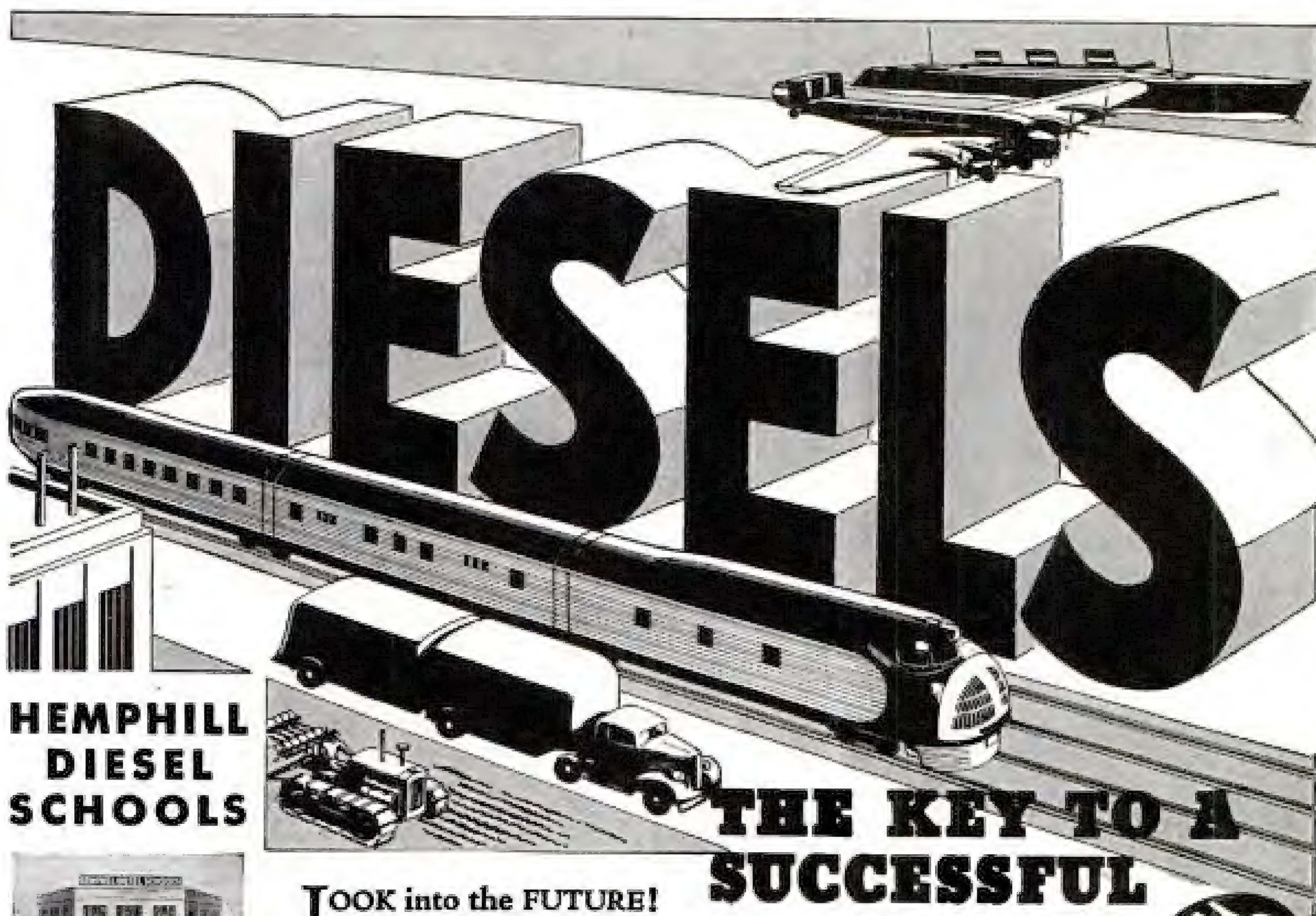
## PENNY EACH!!

Beautiful Window Sign Letters. Lowest Price in America. Finest Quality. 5 Year Guaranteed. New styles. Tremendous Demand. Big Profits. Easily Applied. Record Breaking Offer. FREE Samples and Working Equipment. Hurry!

**Atlas Sign Works**, 7943 Halsted, Chicago, Ill.







## HEMPHILL DIESEL SCHOOLS



New York Schools  
31-26 Queens Blvd.  
Long Island City,  
New York



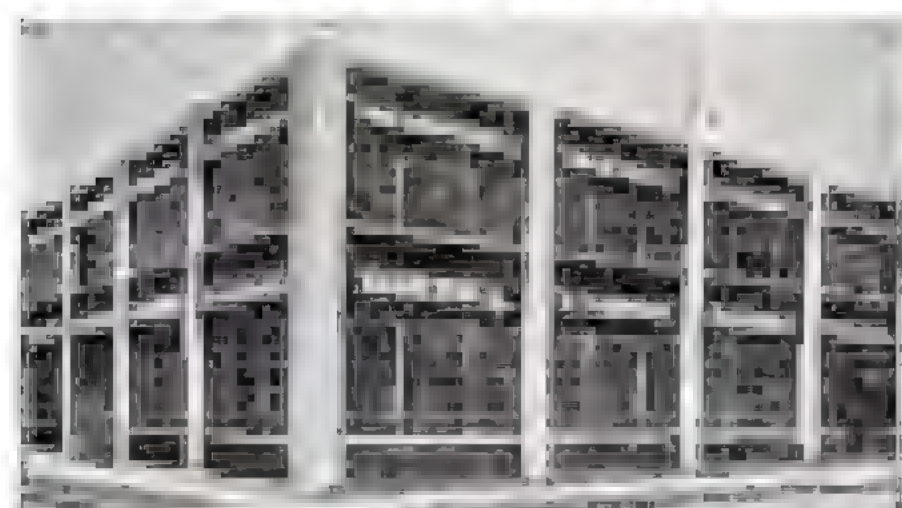
Chicago Schools  
2014 Larrabee Street



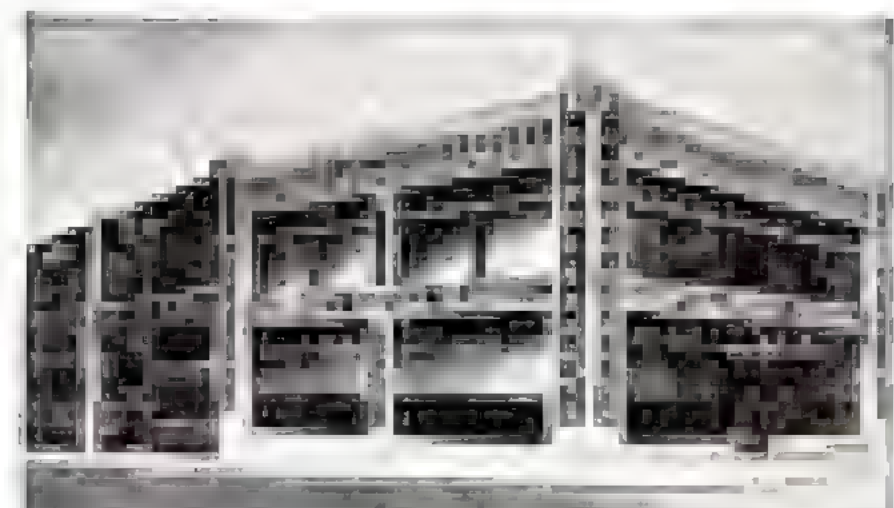
Los Angeles Schools  
2120 San Fernando Rd.



Seattle Schools  
501 Westlake North



Detroit Schools  
2341 W. Lafayette Blvd.



Memphis Schools  
421 W. Monroe Ave.

Also  
Schools at  
1363  
Granville  
Street  
Vancouver  
B. C.

**LOOK** into the FUTURE!  
Do you want to DO THINGS and BE SOMEBODY—become a *success*? Or are you satisfied with your present position in life?

AMBITIOUS men are turning to DIESELS—America's fastest-growing industry. DIESEL power now being used on land, on the sea and in the air; in Transportation, Agriculture, Mining, Power Generation and for every power need. DIESEL installation, operation, maintenance and sales offer great opportunities for trained men.

**START NOW** to learn DIESELS! Be a part of this great movement that is destined to supply the world with efficient, economical power. YOU CAN GET SOME PLACE in DIESELS—with the proper training!

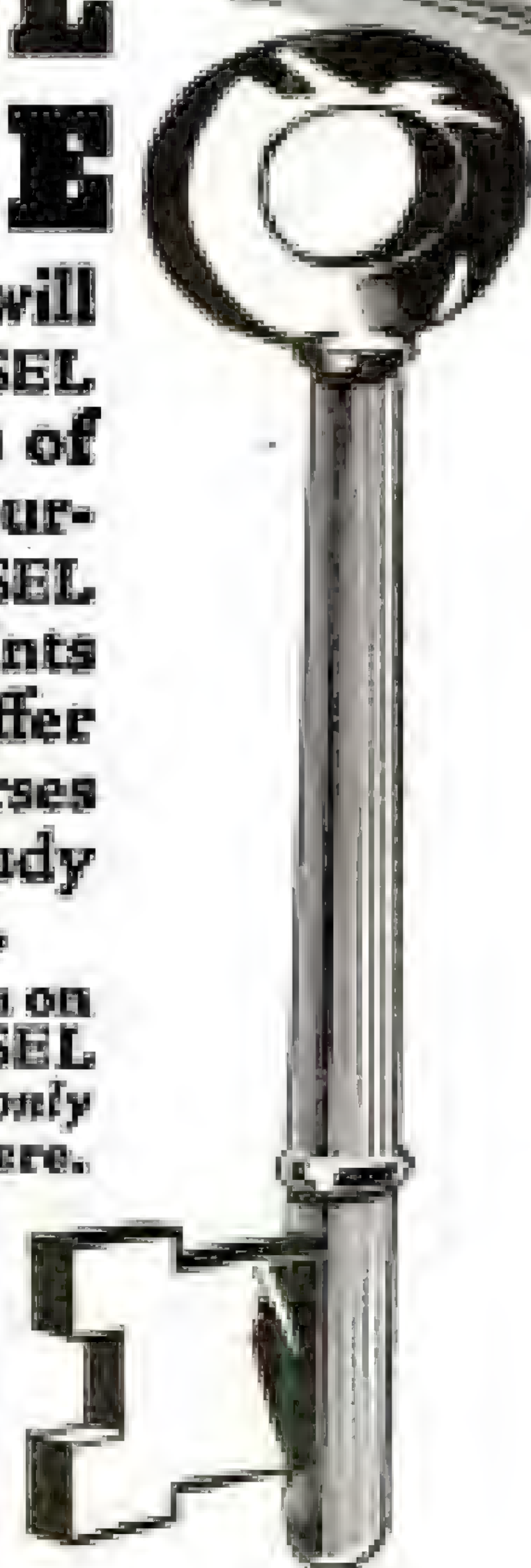
## THE KEY TO A SUCCESSFUL FUTURE

HEMPHILL DIESEL TRAINING will qualify you for *success* in the DIESEL industry. Greatest assemblages of DIESEL Engines for instruction purposes in the world. 7 great DIESEL Schools located at convenient points in the United States and Canada offer Day and Night Residential Courses and a most successful Home-Study Course with later Shop Training.

MAIL COUPON BELOW. It may start you on the road to a successful career in the DIESEL industry. CAUTION: We operate Schools only in the cities and at the addresses shown here.

### SEND FOR FREE COPY OF "DIESEL NEWS"

HEMPHILL "DIESEL NEWS"—first with the latest DIESEL information. Interesting reading—profusely illustrated. Keeps you posted on DIESEL developments. Write or visit any HEMPHILL School for FREE copy.



## MAIL COUPON TODAY

Hemphill Diesel Schools, Dept. P M (nearest address shown): I would like to have, without obligation, full details about your Diesel training courses and a Free copy of "Diesel News".

Name \_\_\_\_\_

Street Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

# HEMPHILL DIESEL SCHOOLS

When writing to advertisers please mention Popular Mechanics





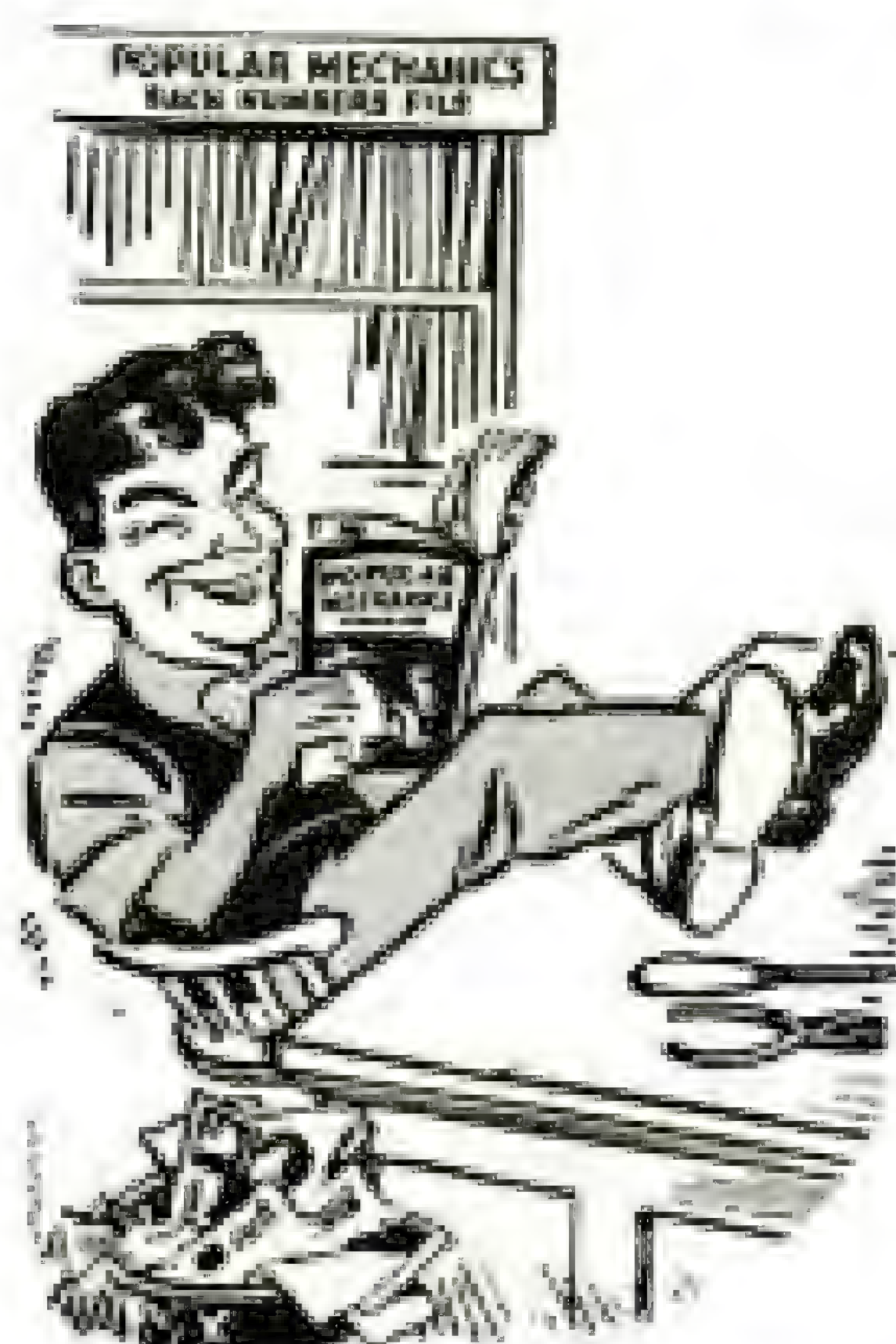
## The Editor's MAIL BAG

### "Let's Go Back"

"I, for one, am in favor of George L. Mann's idea of keeping the index on one

page. When the magazine first changed its method of printing the index, I had a time finding it among the ads. Why not go back to the old Popular Mechanics custom of printing the whole article in one part of the magazine, instead of continuing it on some other page in a different part of

the magazine? I take the staples from the magazine, remove the advertising and then hammer back the staples. But with the present method of printing, I have to keep the ads which take a lot of space."—*Birger N. Swanson, East Providence, R. I.*



### Low-Cost Kayak



"Enclosed is a photo of a kayak I built from your plans. I changed the design a little to suit the materials and tools I had. The cash outlay was \$4.98."—*Fred Schultz, Chicago, Ill.*

### Gas Motor Models

"We want to let you know how we take an interest in your model articles. The

boatmen request that Popular Mechanics consider publishing construction plans of a model gas motor. This would help men who want to start this hobby and Popular Mechanics is the magazine to publish them."—*Members of N. Y. Society of Model Engineers.*

### "Economy Three" Well Named



"Justly entitled to its name, the 'Economy Three' receiver that I built from Popular Mechanics Magazine, was inexpensive and out-performs many four-tube midget sets."—*Charles E. Leber, York, Penna.*

### A Prize Winner

"I am enclosing a picture of one of my airplane models which won first prize at the state fair. It is a monocoque with a wing-spread of nineteen inches."—*Richard Campbell, Nashville, Tenn.*



### Wants More Photography

"Please devote a page or two regularly to photography. A lot of us want more in-

(Continued to page 62A)





**New Invention!** WITH **SUPERCHARGE** PRINCIPLE **SAVES GAS**

**MORE SPEED**  
**MORE POWER**  
**NEW MOTOR LIFE**  
**QUICKER STARTING**  
**UP TO 30% GAS SAVINGS**

**USERS REPORT**  
**3 TO 7 MILES MORE**  
**PER GALLON**  
**MOTORIST SAVES**  
**\$180.00 A YEAR**

"On an International truck on a round trip to Cleveland, 385 miles, it saved 19 gallons of gas."—James Seely, N. Y.

"On my V-8 Ford, it works miracles. Its added power, acceleration and top speed has sold me. The results are unbelievable."—Ralph Fields, Mass.

"Very glad to say, the Buick showed an increase of 5 miles more per gallon."—A. V. Grove, Washington.

"On my Plymouth, I obtained an average of 22 miles per gallon, an increase of 7 miles. This means a saving of \$15 a month or \$180 a year."—F. S. Peck, Calif.

"It saves me one gallon a day. I had to buy 5 gallons each day—now only 4 gallons."—L. V. Sweet, Pa.

"My Chevrolet certainly runs smoother, has more power and snap to it since I put the Vacu-Matic on."—J. H. Nelson, Minn.

"On my Dodge 8 I am getting 6 more miles per gal., with more power and pick-up, which is all anyone could ask."—Lee D. Esty, Calif.

"I have twelve Vacu-matics on cars now, and they all show an increase in mileage. The car owners are very well pleased."—Fred Taylor, Okla.

"I averaged 25 miles per gallon on a trip with a model A Ford at 40 miles per hour, where before I only averaged 20. Also better pickup and smoother running."—Wm. Lyons, Calif.

"I have been placing Vacu-matics on expert mechanics' cars. All are well pleased."—J. W. Donahue, W. Va.

**VACU-MATIC**  
the Carburetor Control that "BREATHES"

AT LAST! Automotive engineers have smashed down the barriers to perfected combustion! The new VACU-MATIC solves the secret of greater power! With almost magical action, this amazing invention instantly puts new life and pep in any motor. It adds mileage to every gallon of gasoline . . . produces split-second pick-up, sensitive accelerator response, quicker starting, greater speed and smoother running.

### *Automatic* -- Nothing Like It!

The self-starter—four wheel brakes—knee action—stream-lining . . . and now VACU-MATIC! The sensational money-saving invention! With it, engineers have achieved a practical means of balancing air and gasoline automatically for all speeds.

Vacu-matic is *entirely different*! It operates on the super charger principle by automatically adding a charge of extra oxygen, drawn free from the outer air, into the heart of the gas mixture. It is entirely AUTOMATIC and allows the motor to "breathe" at the correct time, opening and closing automatically as required. No idling troubles—no carburetor adjustments necessary. It is so simple it will amaze you—so practical it will save you many dollars on gas costs.

### Agents and Salesmen

VACU-MATIC offers a splendid opportunity for unusual sales and profits. Every car, truck, tractor and motorcycle owner a prospect. Valuable territories now being assigned. Check and mail coupon.

### Guaranteed Gas Savings

VACU-MATIC proves itself on every car. It is guaranteed to give worthwhile gas savings, quicker pick-up, and more power or it costs you nothing. You can instantly tell the difference in added power and motor performance — you quickly notice the cash savings on gasoline.

### Fits All Cars

VACU-MATIC is constructed of six parts, assembled and fused into one unit, correctly adjusted and sealed at the factory. Nothing to regulate. Any motorist can attach VACU-MATIC in ten minutes. Once in, its only reminder is the surge of instant power and speed it gives to the motor and the savings it affords your pocketbook.

### Free Details

You owe it to yourself to know all about this remarkable discovery. Mail the coupon below. Start saving gas with VACU-MATIC and enjoy a new driving thrill! There's no obligation—so get the facts now! Write today!

The VACU-MATIC Co.

Wauwatosa, Wis.

### — — — — — FREE OFFER COUPON — — — — —

THE VACU-MATIC COMPANY  
7017 - 187 W. State St., Wauwatosa, Wis.  
Gentlemen: Please send me full particulars concerning the Vacu-matic and details of your Free Offer. This of course does not obligate me in any way.

Name .....

Address .....

City ..... State .....

☐ Check here if interested in selling proposition.

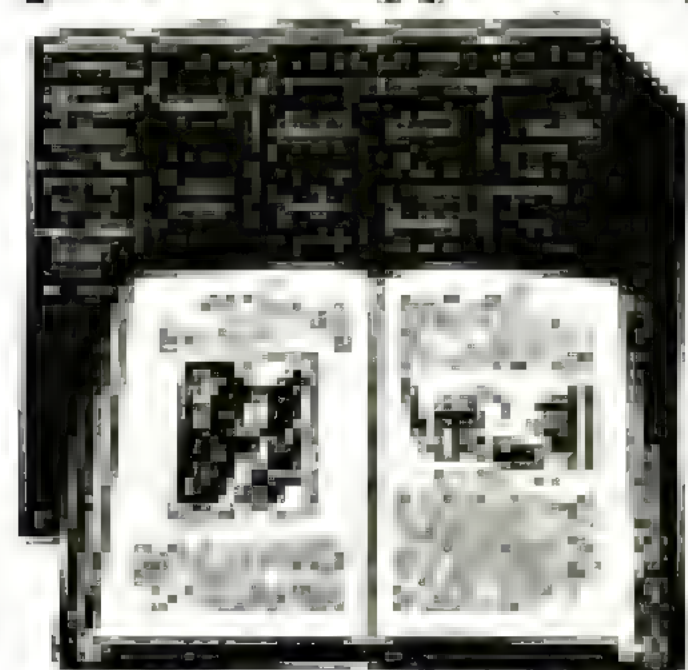
When writing to advertisers please mention Popular Mechanics



# 6 Big AUTO BOOKS

## including DIESEL Engines

Just mail the coupon and we'll send you a set of these remarkable auto books, just off the press. Whether you are a mechanic or helper, expert or apprentice, auto owner or



**6 Big Volumes NEW Edition**

2500 pages, 2000 illustrations, wiring diagrams, etc., including Marine Engines, Aviation Motors, Diesel Engines, etc. DeLuxe edition, gold-stamped flexible binding.

**AMERICAN TECHNICAL SOCIETY**  
Drexel Ave. & 58th St., Dept. A-419, Chicago, Ill.

I would like to see the new 6-volume edition of your AUTO BOOKS. I will pay the few cents delivery charges only, but if I choose to, I may return them express collect. If after 10 days we I prefer to keep them, I will send you \$2 and pay the balance at the rate of \$3 a month, until \$24.99 is paid. Please include free book "Automobile Service Shop Management" as per your offer above. Send very latest edition.

Name.....

Address.....

City.....State.....

Attach letter stating age, occupation and name and address of employer and at least one business man as reference.

## The MACHINISTS' Home-Study Course helps men get ahead

A man can go just so far in machine shop work with only his every-day experience to aid him. The men who get ahead are those who equip themselves with knowledge—who prepare to take advantage of the breaks. Many have done so with these practical books; you can too.

### AMERICAN MACHINISTS' LIBRARY

6 volumes—2000 pages—2,500 illustrations

(A combined home-study course and reference library)

This library of machine shop practice was written for practical men. It gives you the best methods for every kind of machine shop work. It explains machine tools and their operation, tool work, gears and grinding, jigs and fixtures, automatic screw machines, their tools, punches, dies, etc. Plainly written—completely illustrated—the best kind of help to the machine-shop man who wants to advance himself.

Free  
T  
R  
I  
A  
L



No money down—  
only 7c  
a day

### FREE EXAMINATION COUPON

**McGRAW-HILL BOOK CO., Inc., 330 W. 42nd St., NEW YORK**

Send me for 10 days' free examination the AMERICAN MACHINISTS' LIBRARY. If satisfactory I will send \$1.50 in 10 days and \$2 monthly until the special price of \$17.50 is paid. If not wanted, I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

Name.....

Address.....

City and State.....

Position.....

Company..... P. M. 4-36

**Shipped FREE**

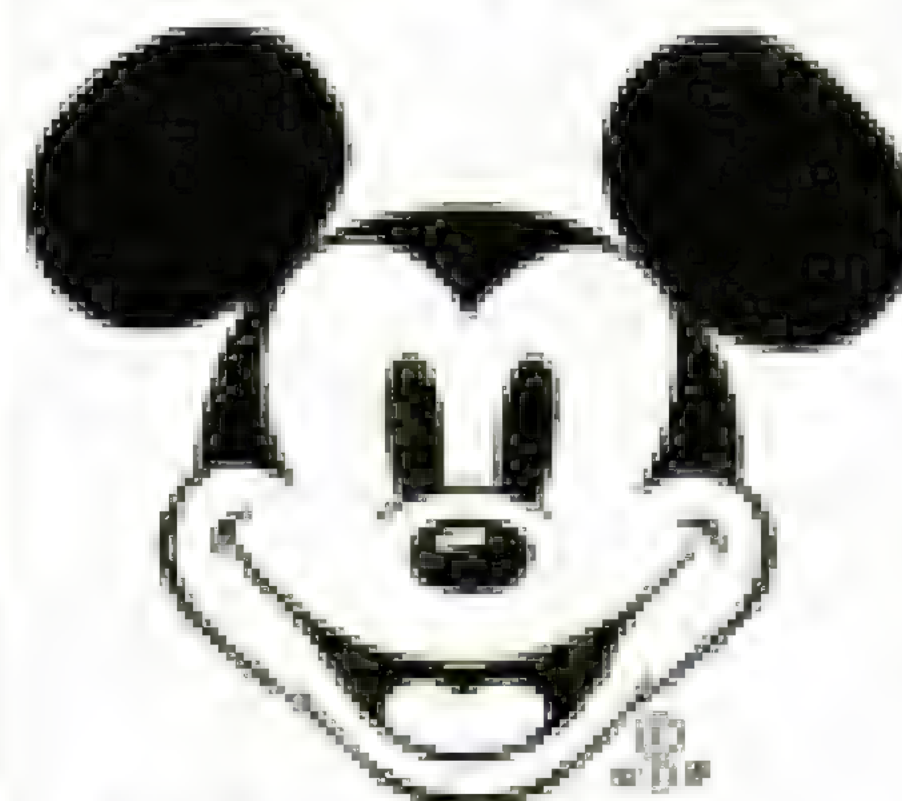
**FOR EXAMINATION**

driver. If you're interested in knowing all about automobile mechanics, then take advantage of this FREE OFFER.

**A Better Job**—In the gigantic auto industry—**BIGGER PAY**—a chance to go into business for yourself and get a share of the huge profits are waiting for any man who tries to improve himself. Learn auto engineering with these wonder books a new way—without studying or memorizing. Simply use the **JEFFY INDEX** to look up the answer to any auto problem.

**FREE** Send NOW and we will include the famous book "Automobile Service Shop Management" without one penny of extra cost. An amazing value and a money maker.

## Walt Disney WANTS ARTISTS



Walt Disney, creator of Mickey Mouse and Silly Symphonies, offers exceptional opportunities to trained male artists. Write for particulars, giving age and occupation. Apply Dept. F.

**Walt Disney Productions, Ltd**

2710 Hyperion Ave.

Hollywood, Calif.

Send no samples!

## PHOTO-ENGRAVING LEARN IT AT HOME



### We Furnish

all equipment and materials including large photo-engraving camera complete with lamps, lens and screen. When you have finished the course you can establish a good paying independent business with the equipment furnished or work for others at a big salary. Photo-Engraving offers greater opportunities today than any other industry. Every picture in this issue of Popular Mechanics was engraved by the process we teach you. Earn good money while learning. Write today for our new illustrated catalog which was engraved on equipment such as we furnish. You will not be obligated in any way by writing.

A copper plate to print above picture size 8 by 10 inches sells for \$15.37.

**Aurora School of Photo-Engraving, Dept. 146, Aurora, Mo.**

## I WANT MEN



**TEA AND COFFEE ROUTES PAYING UP TO \$60.00 A WEEK**

National company needs men thru at once to make regular calls on local routes. No experience needed. Operate on our capital. I need everything; give you brand new Ford car as bonus. Rush name on postcard. Get free facts. No obligation. Act today.

**Albert Mills, 1632 Monmouth, Cincinnati, O.**

## No JOKE TO BE DEAF

—Every deaf person knows that—



Mr. Way made himself hear his watch tick after being deaf for twenty-five years, with his Artificial Ear Drums. He wore them day and night. They stopped his head noises. They are invisible and comfortable, no wires or batteries. Write for TRUE STORY. Also booklet on Deafness.

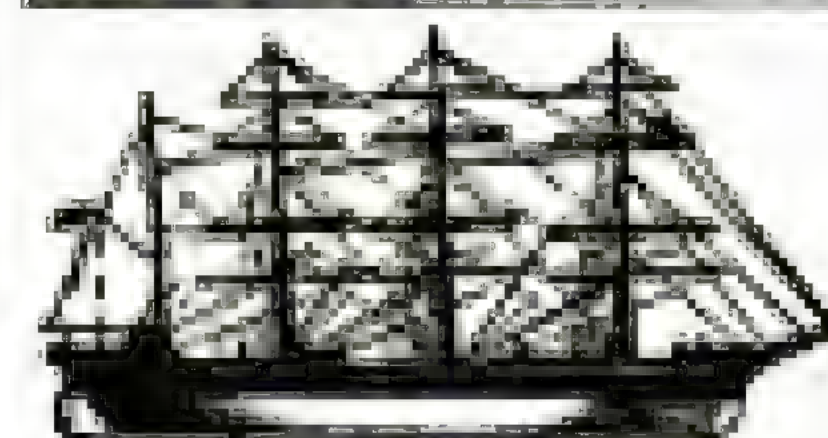


**THE WAY COMPANY**

720 Hofmann Bldg.

Detroit, Michigan

**\$ AGENTS 500% Profit GOLD LETTERS**  
For Store Fronts and Office Windows. Anyone can put them on. Free samples. Liberal Offer to general agents.  
**METALLIC LETTER CO., 438 N. Clark St., Chicago**



**Build the 4-mast Barque, California**

Accurate, detailed blue prints of this handsome steel barque. Complete fittings and construction sets for steam trawler and other popular models, including Sovereign of the Seas. Send 15c for illustrated catalog.

**A. J. Fisher, 1002-1 Etwah Ave., Royal Oak, Mich.**

## NEW SCIENTIFIC WONDER

### "X-RAY" CURIO

10c

3 for

25c



Reg. U. S. Pat. Off.

**BOYS BIG FUN.** You apparently see thru Clothes, Wood, Stone, any object. See Bones in Flesh. **FREE PACKAGE** radio picture films, take pictures without camera. "You'll like 'em." 1 package with each 25c order.  
**MARVEL MFG. CO. Dept. 80 — NEW HAVEN, CONN.**

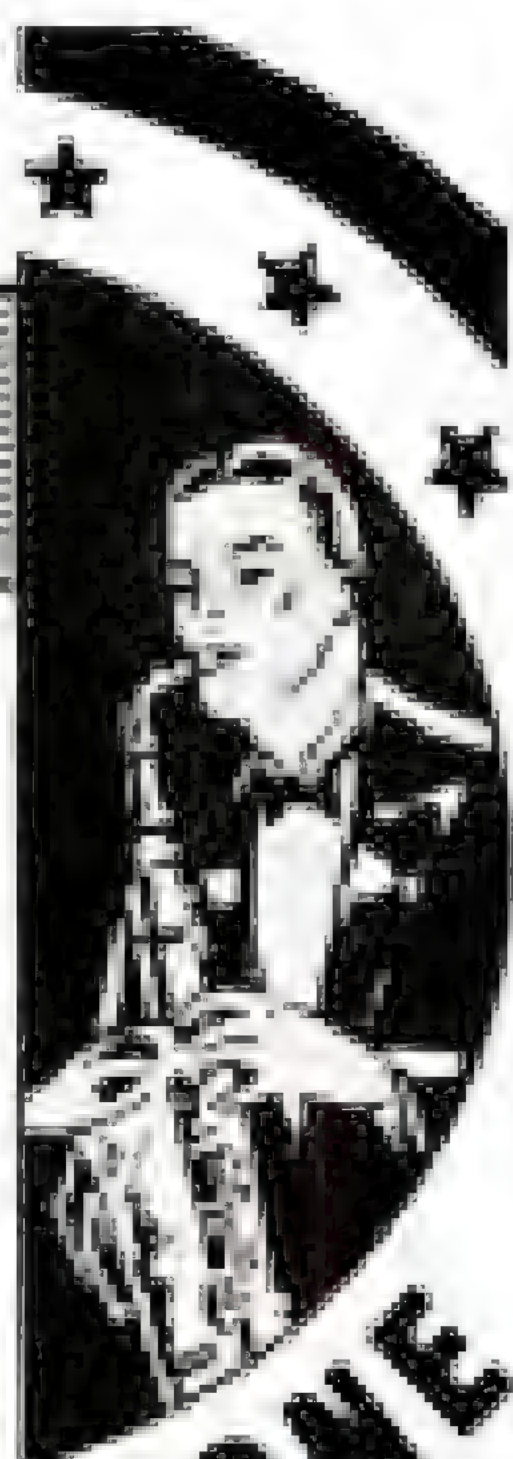


GO PLACES! *with a***BUESCHER**

Popularity... pleasure... fame... fortune... all may be yours when you play a sweet-toned Buescher Saxophone. **Easy playing** qualities and exclusive Buescher features give you quick mastery. Play tunes the first week... make new friends... **go places with a Buescher!**

**FREE TRIAL; Easy Payments** on saxophone, trumpet, trombone, clarinet—any instrument for band or orchestra. **Write now** for free Buescher Book—mention instrument which interests you.

1008-A  
BUESCHER BAND INSTRUMENT CO.  
410 Buescher Building, Elmhurst, Indiana

**TRUE TONE**

**Make up to \$150 Weekly GIVING AWAY**  
**FREE RCA LICENSED RADIOS**

RCA Licensed Automobile and Home Radio Sets for American, European and South American Reception. Beautiful World Master floor model radios. **Guaranteed foreign reception.** Custom made with exclusive all matched walnut cabinet, aeroplane dial, twin illumination, dynamic speaker and automatic volume control. Given away absolutely **FREE** with our new sensational unique **PUNCH SALES CARD PLAN.** This is the opportunity of the year—make up to \$150 cash each week for yourself. Every house, car owner, store, office, factory, hotel, club or individual wants these marvelous new **FREE RCA LICENSED RADIOS.**

Can also furnish Radios for Battery Use.  
**WRITE TODAY FOR OUR NEW STARTING OFFERS**  
Start at once making money! with our unique sales plan. Write for full information how you can secure any or all of these plans.  
**DELUXE MFG. CO., Dept. 249, 173 W. Madison St., Chicago, Ill.**

**ITCHING Torture**  
**STOPPED IN ONE MINUTE**

For quick relief from the itching of eczema, blotches, pimples, athlete's foot, rashes and other skin eruptions, apply Dr. Dennis' cooling, antiseptic, liquid D. D. D. **Prescription.** Its gentle oils soothe the irritated skin. Clear, greaseless and stainless—dries fast. Stops the most intense itching instantly. A 35c trial bottle, at drug stores, proves it—or money back. Ask for—

**D.D.D. Prescription**

**CASH** for you every week in the year raising **ROYAL** baby birds. Orders waiting for hundreds of thousands. Easy to raise. You get your money for them when only 25 days old. Particulars and picture book for 3-ct. U. S. stamp.  
**Write PR COMPANY, 635 Howard St., Melrose, Massachusetts. Refer any bank.**

**RAISE RABBITS FOR US**

WE PAY YOU UP TO \$5.00 EACH. ALSO PUT YOU IN TOUCH WITH MARKETS EVERYWHERE. Large illustrated book and catalog, also copy of the **AMERICAN RABBIT FARMER** and monthly market bulletin showing names of buyers in various parts of America who continuously buy all rabbits offered them. All for 10 cents. Address **OUTDOOR ENTERPRISE CO., 101 Main St., Holmes Park, Mo.**

**Best Poultry Paper 6 BIG ISSUES 10¢**

Helps increase Poultry Profits. Send coin or stamps, 50 cents for 3 years or 10 cents for 6 months trial. Agents wanted. **American Poultry Journal** 532 So. Clark Street Chicago, Illinois

**Make Money at Home!**

**GROW MUSHROOMS** in your cellar or shed. Exclusive new process. Bigger, better, quicker crops. More money for you! Earners see demand. We buy Mushrooms. Write for Free Book.

**American Mushroom Industries Ltd., Dept. 599, Toronto, Ont.**



**U.S. GOVERNMENT JOBS**



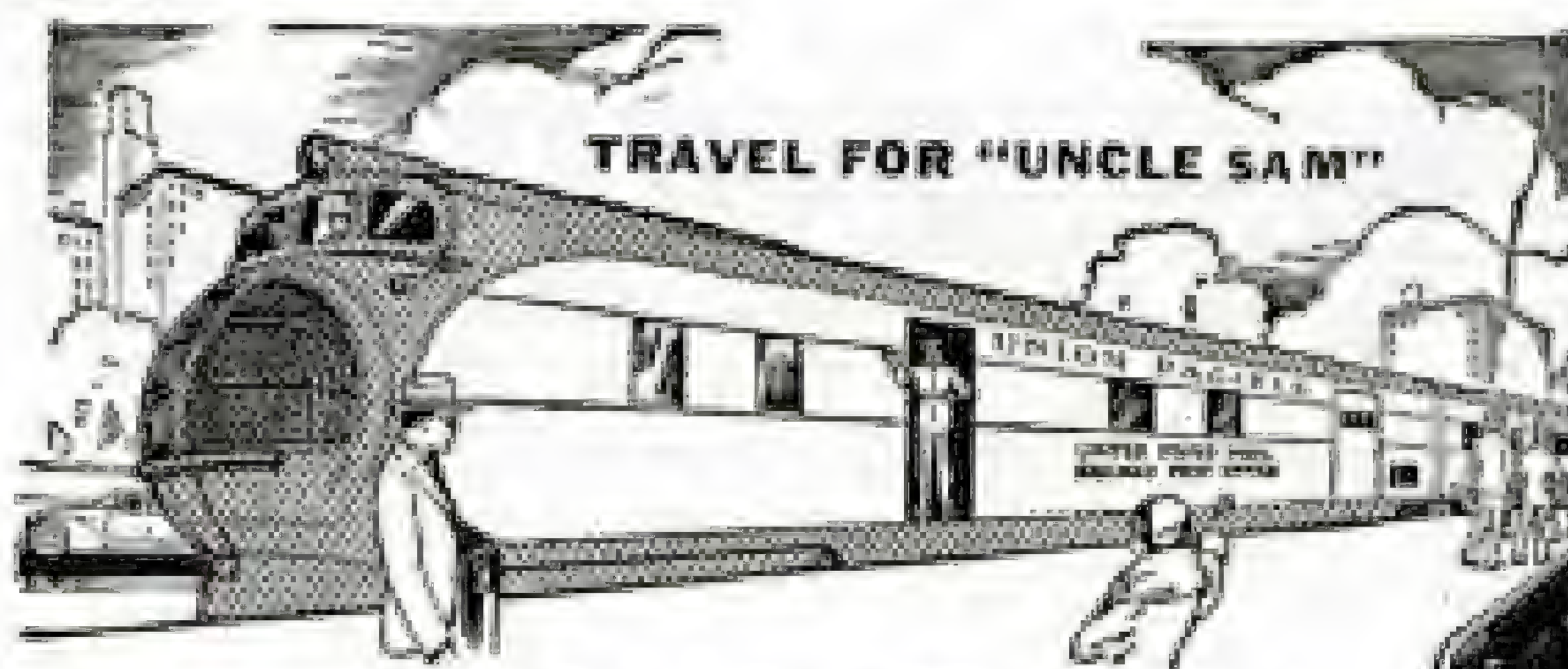
**START \$1260 to \$2100 YEAR Men--Women**

**Common Education Usually Sufficient Influence Not Needed**

**New 40 Hour Week means many Postal Vacancies**

The Postal Department recently went on a 40 hour week (from 44 hours). This is expected to mean many Postal appointments during 1936.

Railway Postal Clerks get \$1,900 the first year, on regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is quickly increased to \$2,450. Chief Clerks get \$2,700 a year.



**3 Days On—3 Days Off—Full Pay**

Railway Postal Clerks on long runs, usually work 3 days and have 3 days off duty or in the same proportion. During this off duty their pay continues just as though they were working. They travel on a pass when on business. When they grow old, they are retired with a pension.

**City Mail Carriers, Post Office Clerks**

Post Office Clerks and Carriers get \$1,700 the first year on regular and automatically increase \$100 a year to \$2,100 with special increase to \$2,300 for Clerks. New 40 hour week (from 44) means hundreds appointments.

**Customs Inspector**

Salary \$2,100 to start. Men 23 to 45. Work connected with examining baggage and merchandise entering the country from foreign parts covering boats, trains, roads, automobiles, etc.

**Let Us Show You How**

Experience is usually unnecessary and political influence is not permitted. Let us show you how to get a government job.

**Get Free List of Positions**

Fill out the following coupon. Tear it off and mail it today—now, at once. This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. H183, Rochester, N. Y.

Rush to me entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "U. S. Government Positions and How to Get Them," with sample coaching tests; (3) List of U. S. Government Jobs; (4) Tell me what to do to get a U. S. Government Job.

Name.....

Address.....

Use this Coupon before you mislay it. Write or Print Plainly.



# PATENTS

Booklet Free      Highest References  
Promptness Assured      Best Results

Send drawing or model.

## ALL BUSINESS GIVEN PROMPT AND PROPER ATTENTION

Listed Patent Lawyer in the latest editions of the Rand-McNally Directory of Bankers and Bank-Recommended Attorneys, published by Rand-McNally & Co., Chicago, Ill.; The Baggott & Ryall Directory of Guaranteed Attorneys, published by Legal Directory Corporation, Boston, Mass.; Flugel's Law List, published by Legal Directory Publishing Co., St. Louis, Mo.; American Lawyers Annual, Cleveland, Ohio; Bankers Service Legal Directory, Bankers Service Co., Boston, Mass.; Eyre's Law List, 9 Park Place, New York City, and the Central Guarantee Co., Bankers and Lawyers Directories, Empire State Bldg., New York City.

**WATSON E. COLEMAN,**  
REGISTERED PATENT LAWYER

Victor Building, 724 Ninth Street, N. W.  
**WASHINGTON, D.C.**

## INVENTORS PATENT YOUR IDEAS SEND FOR FREE BOOK

### HOW TO OBTAIN A PATENT

Written by a Former Member of the Examining Corps (1922-24) of the U. S. Patent Office. If you want to profit by your ideas, you should take steps to apply for a U. S. Patent at once. Your first step is to get this Free Book. This interesting illustrated book contains valuable information you should have. It tells you fully how to obtain a patent on your idea in the quickest way. With this Free Book you will also receive a "Record of Invention" form on which you can easily record your idea. Personal and Confidential Service: Your case will be personally handled only by a Registered Patent Attorney who is also a Former Member of the Examining Corps of the U. S. Patent Office. All communications confidential.

MAIL COUPON TODAY for FREE PATENT BOOK and RECORD OF INVENTION Form.

**CARL MILLER**  
REGISTERED PATENT ATTORNEY  
FORMER MEMBER EXAMINING CORPS U. S. PATENT OFFICE

1638 Woolworth Bldg., Dept. 46A, New York City  
MILLER BUILDING, Dept. 46A, WASHINGTON, D. C.  
Please send me your Free Book, "How to Obtain a Patent" and your "Record of Invention" form.

NAME.....

ADDRESS.....

## don't WORRY

Why put up with years of needless discomfort and worry? Try a Brooks Automatic Air Cushion. This marvelous appliance permits the opening to close, yet holds reducible rupture securely, comfortably—day and night. Thousands report amazing results. Light, neat-fitting. No hard pads, metal girdle or parts to chafe or gouge. Patented in U. S. and 13 foreign countries. Try one 10 DAYS WITHOUT A PENNY'S RISK. You'll be delighted. Free Book on Rupture and convincing facts mailed postpaid in plain envelope. **BROOKS COMPANY, 111C State St., Marshall, Mich.**



## PATENTS—TRADE MARKS

All inventions submitted held confidential and given personal attention by members of the firm. Form, "Evidence of Conception" and instructions, "How to Establish Your Rights"—FREE!

**LANCASTER, ALLWINE & ROMMEL**  
Patent Law Offices

412 Bowen Bldg.

Washington, D. C.

## Inventions Wanted Patented or Unpatented

We successfully sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale.

Chartered Institute of American Inventors  
Dept. 4, Barrister Building, Washington, D. C.



## GEARS

In Stock—Immediate Delivery

Gears, speed reducers, sprockets, thrust bearings, double couplings, pulleys, etc. A complete line is carried in our Chicago stock. Can also quote on special gears of any kind. Send us your blueprints and inquiries.

Write for Catalog No. 10

**CHICAGO GEAR WORKS**  
769-773 W. Jackson Blvd., CHICAGO, ILL.

## INVENTORS

who derive largest profits know and heed certain simple but vital facts before applying for patents. Our book, Patent-Sense, gives those facts; sent free. Trade Marks—Copyrights. **LACEY & LACEY, Est. 1869, 635 F St., N. W., Dept. 5, WASHINGTON, D. C.**

**ALBERT E. DIETERICH**  
REGISTERED PATENT ATTORNEY  
512 B Colorado Building, WASHINGTON, D. C.  
Booklet on Patents sent free



Send for Catalog Today

## BUCHSTEIN'S FIBRE LIMB

is soothing to your stump—strong, cool, neat, light. Easy payments. Braces for all deformities. Agents wanted.

**D. BUCHSTEIN CO.**  
810 3rd Ave., So., MINNEAPOLIS, MINN.

## To PROTECT Your INVENTION—Use this coupon, NOW

Delays are dangerous and may be very costly. My personal service assures prompt action, strict confidence, and a minimum of expense. I suggest that you send me a model or drawing, or sketch and description of your invention, and \$5.00. I will make a search and report

promptly as to its patentability and send you a copy of my 72-page booklet. Or, if you prefer to read my booklet first, mail the attached coupon at once. I will also send my "Record of Invention" form. (Over 38 years experience as a Registered Patent Attorney.)

**L. F. Randolph,** 302-D Victor Bldg., Washington, D.C.

Please send me at once, free of charge, your 72-page booklet and "Record of Invention" form.

Name.....

Address.....

**A PERSONAL CONFIDENTIAL PATENT SERVICE—**



# You'll have BARRELS OF FUN

## when you learn to play this easy as A-B-C way

**SUPPOSE** you suddenly found you could play easily on your favorite musical instrument! Think of the fun you would have—how much in demand you would be! Do you know that now you can do this in a surprisingly short time? Thousands who never played music until a few months ago are getting thrills of enjoyment from a talent they never knew they had.

Even though you don't know one note from another, by this simple new short-cut method you can actually learn to play any popular instrument.

The secret of the U. S. School of Music system is simplicity. The lessons come to you by mail. They consist of complete printed instructions, simple diagrammatic pictures, and all the music you need. No grinding routine. Study when you feel like it—at home. In an almost unbelievably short time you find that you are actually playing! Jazz, musical comedy hits, movie theme-songs, even classics—you learn to play them all.

### LEARN TO PLAY BY NOTE

Piano Violin  
Guitar Saxophone  
Organ Ukulele  
Tenor Banjo  
Hawaiian Guitar  
Piano Accordion

Or Any Other  
Instrument

### FREE PROOF

If social popularity and increased income appeal to you—send today for FREE Demonstration Lesson with illustrated book describing the new famous U. S. School of Music "print-and-picture" method of learning.

Just mail the coupon. Then judge for yourself when you receive free lesson and descriptive material. U. S. School of Music, 74 Brunswick Bldg., New York City. Instruments supplied when needed, cash or credit.



U. S. SCHOOL OF MUSIC,  
74 Brunswick Bldg., New York City

Send me your amazing free book "How You Can Master Music in Your Own Home" with inspiring message by Dr. Frank Crane; also Free Demonstration Lesson and particulars of your easy payment plan.

Name.....

Address.....

Instrument..... Have you Instr.?

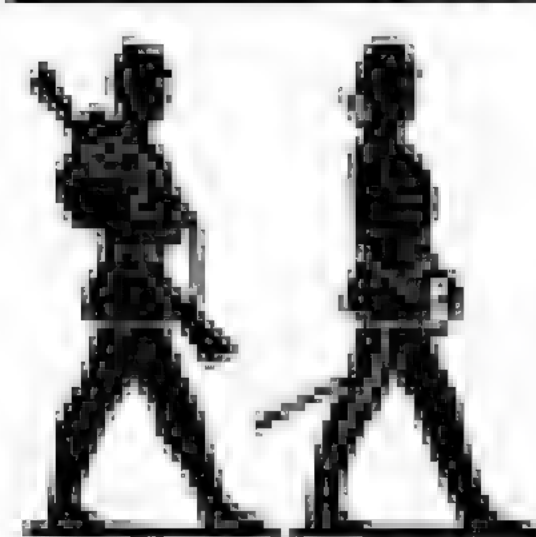
## QUICK WAY to make money in



**RADIO** Modern receivers are demanding men with modern training for service work. New training method and service equipment offer starts you earning almost at once. Up to \$3 an hour easy in a short time. Write today for FREE book of details.

Radio Training Association of America  
Dept. PM-84, 4513 Ravenswood Ave., Chicago

**ARMY AND NAVY SUPPLY CO.**  
Bargains—Army, Sport Goods, Firearms, Clothes, Shoes, etc. Send 10c for new catalog, to be redeemed on first order.  
Army & Navy Supply Co. 4772 Lester St. Richmond, Va.



Forms to cast Lead Soldiers, Indians, Trappers, Hunters, Wild and Farm Animals. 239 different forms to select from. Every form guaranteed to cast perfect figures. Send 5c stamp for illustrated catalogue.

HENRY C. SCHIERCKE Spencer Rd. GHENT, N.Y.



**Inventors and Mechanics**  
Send 10 Cents in Coin or Stamps for Material and Gear Circulars  
COLBURN GEAR & MFG. CO.  
96 Holmes St., Quincy, Mass.

## UNPATENTED IDEAS CAN BE SOLD

We tell you how and help you make the sale. Particulars, with list of manufacturers and wanted inventions, sent free on request.

Write **W. T. GREENE**  
973 Barrister Building Washington, D. C.

## NEW DIESEL ENGINE BOOK

**ELEMENTS OF DIESEL ENGINEERING**—Stationary—Marine—Locomotive—Automotive. By Orville Adams. Just the book to prepare you to enter this wide field for profitable and interesting employment created by the increasing use of the Diesel Engine in diverse fields. The Diesel industry requires thousands of trained men to operate, maintain, repair and sell this Engine. This volume is excellent for men without previous knowledge of the subject. Study it. Questions and answers at the end of each chapter, for review. 478 Pages, 284 Illustrations. Price \$4.00. Also "MODERN DIESEL ENGINE PRACTICE" by Adams. A complete volume on every phase of operation, maintenance and repair of the Diesel Engine. 600 Pages, 400 Engravings, price \$6.00. Send for complete catalog.

**NORMAN M. HENLEY PUBLISHING COMPANY**  
2 West 45th Street New York, N. Y.

## INVENTORS PATENT YOUR IDEAS

### Get this FREE Book

Protect the future profits from your idea by securing a U. S. Patent. Delays are often dangerous. I give prompt and personal attention to your case—nothing is entrusted to unskilled assistants. The Patent Office itself urges you to select a Competent Registered Patent Attorney in order to protect your interests properly. Therefore, before doing anything else, send for my NEW FREE BOOK and get the full facts, and with it I will send you my FREE "Record of Invention" form. All correspondence strictly confidential. Mail Coupon TODAY.



**L. EDWARD FLAHERTY**  
REGISTERED PATENT ATTORNEY

706 International Building WASHINGTON, D. C.

Please send immediately your FREE book and Record of Invention Form.

Name.....

Address.....

City..... State.....



# Accountancy Home-Study

## made interesting and practical thru problem method

**Y**OU know as well as we do that Accountancy fits many men for positions that pay three and five and ten thousand dollars a year—gives many other men unusual opportunity to start a profitable growing business of their own.

You probably realize also that—because of the new state and federal legislation—the accounting profession faces now and for the next few years the greatest opportunity it has ever had.

The only question is—just how practical is it for you to train yourself adequately in Accountancy through home study?

And the answer lies in the LaSalle Problem Method.

For this modern plan of training not only makes Accountancy study at home thoroughly practical but makes it interesting as well.

And here's how:

### You Learn by Doing

Suppose it were your privilege every day to sit in conference with the auditor of your company or the head of a successful accounting firm. Suppose every day he were to lay before you in systematic order the various problems he is compelled to solve, and were to explain to you the principles by which he solves them. Suppose that one by one you were to work those problems out—returning to him every day for counsel and assistance—

Granted that privilege, surely your advancement would be faster by far than that of the man who is compelled to pick up his knowledge by study of theory alone.

Under the LaSalle Problem Method you pursue, to all intents and purposes, that identical plan. You advance by solving problems.

Only—instead of having at your command the counsel of a single individual—one accountant—you have back of you the organized experience of the largest

business training institution in the world, the authoritative findings of scores of able accounting specialists, the actual procedure of the most successful accountants.

Thus—instead of fumbling and blundering—you are coached in the solving of the very problems you must face in the higher accounting positions or in an accounting practice of your own. Step by step, you work them out for yourself—until, at the end of your training, you have the kind of ability and experience for which business is willing and glad to pay real money—just as it was glad to pay these men.\*

### Five Men Who Tested and Proved It for You

For instance, there was the man who started Accountancy training with us in 1916. After a short period of study, he took a position as bookkeeper for a year, and then became accountant for a leading automobile manufacturer—with two bookkeepers under him. Today he is auditor of one of the foremost banks in his state and his salary is 325 percent larger than when he started training.

He writes, "My training is the best investment I've ever made, showing a cash value running into five figures."

And the young clerk, earning \$75 a month eleven years ago and now getting many times that as general auditor for an outstanding, nation-wide organization. Within six months after he began our training, he was earning \$125 a

month and within four years, he was earning \$250.

Do you wonder that he writes, "While LaSalle ads once seemed like fairy tales to me, now I know from personal experience that they are true."

Or let us tell you about two men—one a stenographer and the other a retail clerk—neither of whom knew more than the simplest elements of bookkeeping. One is now the comptroller and the other the assistant comptroller of a large company.

"LaSalle training in Higher Accountancy," write both, "was the important factor in our rapid climb."

And if you are thinking about the C. P. A. degree and a public accounting business of your own, read about the pharmacist who was earning \$30 a week eleven years ago when a LaSalle registrar secured his enrollment for Accountancy training. Eight months later he left the drug store to take a bookkeeping job at \$20 a week—less money but larger opportunity. Three years later he passed the C. P. A. examination and a year later yet he was earning \$5,000 a year. Now he has his own highly successful public accounting firm for which he says, "My LaSalle training has been largely responsible."

### One-Tenth of All C. P. A.'s Are LaSalle Trained

If you want still more proof, remember that 1,200 C. P. A.'s—approximately one-tenth of all those in the United States who have ever passed the difficult examination for this coveted degree—are LaSalle trained.

And knowing these facts, ask yourself if there can be any further question about the practicability of this training for you—ask rather if the real question is not about the size of your own ambition and the quality of your determination.

For Accountancy is no magic wand for the lazy or the fearful or the quitter—it offers success only to the alert adult who has the courage to face the facts and the will to carry on till the job is done.

If you are that individual, the coupon below, filled out and mailed, will bring you free the information that can open up to you the future of which you have dreamed—ability and income and success.

Is it not worth getting that information?



Send for  
This Book

\*Names and addresses given on request.

## LaSalle Extension University

LaSALLE EXTENSION UNIVERSITY, Dept. 464-HR, Chicago, Ill.

Please send me, free of all cost or obligation, your 64-page, illustrated book, "Accountancy, the Profession That Pays," telling about the profession of accountancy and your training for success in that field.

Name.....

Address..... City.....

Position..... Age.....

When writing to advertisers please mention Popular Mechanics







# CLASSIFIED Advertisements



Advertisements in this section, 35 cents per word, each insertion, minimum 10 words, payable in advance  
To be inserted under proper classification in May issue, copy should be in our office March 10th  
Popular Mechanics Magazine, 200 East Ontario Street, Chicago, Illinois

## YOU'LL PROFIT

By reading and answering the classified ads in this section. Hundreds of opportunities to make and save money.

Popular Mechanics Magazine, Chicago, Ill.

Dear Sirs: We have used the classified pages of Popular Mechanics for some time. We have found that your magazine is in a class by itself, when it comes to pulling power. Popular Mechanics pulls for us on an average of 25% more inquiries than any other magazine with the same or higher word rate. These inquiries average around 28% in cash sales. This is almost 5% greater than Popular Mechanics Magazine's nearest competitor. When other magazines fall down, we rely on the old standby Popular Mechanics, to help pay their cost. With the best of wishes for your continued success, we are  
Cordially,  
EDW. J. DUFFY.

(Original letter on file in our office)

### AUTOMOBILES

**OPERATE** Your automobile on 5c fuel oil. No radical changes in motor necessary. Permits operation on either gasoline or oil. Instructions \$1.00. Details on request. Acme Industries, Box 6332, 5229 Market St., Philadelphia, Pa.

**200 MILES** 35c. Burn stove distillate in your car. Get parts in any junk yard. Complete detailed information and blueprint 50c (coin). C. C. Carmichael, 5013 2nd Ave., Los Angeles, Calif.

**CONVERT** Your automobile to burn Diesel oil, inexpensive; save seventy per cent. Send one dollar full instructions; save hundreds. Dual Manufacturing Company, 1130 Broadway, Seattle, Washington.

**USED Tires**, all sizes, \$1.95 up. Truck tires \$4.95 up. Send dollar, balance C.O.D. Walraven's, Zanesville, Ohio.

**MIDGET** Racing. Get full details on this thrilling sport; facts for fans, builders, drivers; track sizes, regulations; car specifications, pictures, working drawings. Book tells all about Indianapolis cars, Miller-Fords and world's fastest car. Brand new Automobile Racing, fourth edition, \$1 postpaid, \$1.12 C.O.D.; 3c tax if you live in Ohio. Ray F. Kuns, Dept. 19, Madisonville, Cincinnati, Ohio.

**SEMI-DIESELIZE** To economize. Use Diesel oil in your present car. Conversion cost less than \$5.00. Guaranteed. Easy to install. Send 3c stamp for full details. Complete working plans \$1.00. E. Andell, 4334 Palmer Str., Dept. A, Chicago, Ill.

**WATURBINE** Converts any gasoline motor to semi steam. Increases gasoline mileage, power, speed, 10 to 65 percent. Prevents carbon. Outlasts the motor. Postpaid \$12.85, state motor number. General Motors, 1917 Washington, Portland, Oregon.

**FORD Owners!** Does your "Model A" use oil? Oil control splash plates. Increases oil mileage 400% (easily installed). Price \$2.50 with order, or C.O.D. Moneyback guarantee. Electric Metal Products Company, Box 392, Concordia, Kansas.

**SEMI-DIESELIZE-To-Economize.** Convert your car for \$2.75 to \$5.00 and burn cheap Diesel oil. Works on any car. No major changes made in motor. Anyone of average mechanical ability can install. Parts available everywhere. 6 big (8 1/2"x11") sheets of copyrighted drawings and instructions showing 2 different, tested, methods of conversion \$1.00. Free booklet, stamp appreciated. Order your copy today. Earl Behling, Box 944, Los Angeles, Calif.

**START** Your car in a jiffy, in zero weather. Auto engineers neverfail starting secret disclosed, no gadgets to attach. Secret yours for 25c. Ring's, 12524 Moran, Detroit, Mich.

**LATEST** Automobile invention: Automatic foot-shift attachment for Fords, Chevrolets and others. Easily installed. Specify year, car. Money back guarantee. \$1.50. Safety-Shift, 6201 Famous, St. Louis, Mo.

**SEMI-DIESEL** Conversion for gasoline motors, \$12.00. Money-back guarantee. Particulars 3c stamp. Desogas Company, 1719 Addison, Berkeley, California.

**MIDGET** Car parts and plans. Complete illustrated catalog. Dime. Bates Motors, 4877 Armitage, Chicago.

**R & R Mfg. Co.**, Anderson, Indiana. Enclose 20 cents for 1936 catalogue. Racing equipment, Midget included.

### AUTO SUPPLIES AND EQUIPMENT

**WINDSHIELDS** Cleared of mist and ice, guaranteed formula 50c. J. Landgraf, Jr., 97 Park St., Chilton, Wis.

**GASO-LUBRITABS**—Amazing new automotive discovery. Proven 25%-40% more power, mileage, gas, oil, battery economy! Perfect winter starting. Protective heatproof lubrication. Cuts repair bills. Trial (30 gallon) size—25c (coin). Gaso-Lubritabs, Box 1144, Kalamazoo, Michigan.

**COMPLETE** Tire grooving tool—three dollars. Circular free. Meltz Tire & Rubber Company, Inc., New Brunswick, N. J.

**DEMONSTRATORS.** Compressor, test bench, 8-hour battery charger—are welder. Guaranteed. Trial and terms. Ken's Equipment Exchange, Box M-402, Troy, Ohio.

**AUTO** Radiator anti-rust. Prevent corrosion this summer. Send 25c. H. E. Products, Box 223, Schenectady, N. Y.

**DON'T** Employ mechanics! Use "Auto Flash" Tester. \$2.50. A. Lopes, Pleasantville, N. Y.

**TRAILER.** House car type. Sleeps two people. Choice of three floor layouts. Sturdy. Economical to build and haul. Complete plans 25 cents. Mascotte, 111 W. Washington, Chicago.

**PLATING** Outfits for automobile parts. Connect to battery. No tanks used. Free particulars and proofs. Guzman Co., Ave. J, Decatur, Ill.

### A. C. GENERATORS

**PRACTICAL** Changes for automobile generators. See our advertisement at bottom of page 139A. Autopower, Inc.

### AUTO TRAILERS

**CABIN** Trailer; sleeps two, light weight, mono-wheel, sensational handling. \$295.00 complete. Send stamp for literature. Brooks Boat Co., Inc., 2208 So. Hamilton, Saginaw, Michigan.

**BUILD** One wheel trailer. Send dime for particulars. Plans, blueprints, \$1.00. Economy Trailer Co., Box 613, Sedan, Kans.

**\$1 VALUE** For 50c. Get facts on trailer coach design. This 50-page book can save you 100 times its cost. Order direct from author. Money back if not satisfied. 2c tax in Ohio. Ray F. Kuns, Dept. 129, Madisonville, Cincinnati, Ohio.

**TRAILER-ITES!** See advertisement of Trailer Travel Magazine on page 141A.

**TRAILER** Hitches \$1.95. Heavy duty \$2.95. Send dollar, balance C.O.D. Walraven's, Zanesville, Ohio.

### MOTORCYCLES, BICYCLES AND SUPPLIES

**SEND 10c** For 24 page handbook of information, listing new and used parts, accessories, tires, batteries, for Indian, Harley, Excelsior, Henderson. Boots, 622 E. Grand, Des Moines, Iowa.

**POWER** Your bike with low priced Speed-bike motor. Attach in one hour. Eighty miles to gallon. Thirty miles an hour. Free folder. Guaranteed. Outboard Motor Corp., 4036 N. 28th St., Milwaukee, Wis.

**LET** Us supply your motorcycle needs. Expert repairing. Complete stock of genuine Harley Davidson parts, accessories, oil, tires, riding apparel, etc. 24 hr. service. Send 10c for Used Motorcycle Bulletin and Accessory Catalogue. (No used parts.) Bill Knuth, The Harley Davidson Distributor, 2491 W. Fond du Lac Ave., Milwaukee, Wisconsin.

**MOTOR** Bicycles \$45, motorcycle tires \$3.95, boy's wheels \$1. Dealers, renters bicycles \$13.50. Send 12c. Deningers, Rochester, N. Y.

**SEND 10c** Stamps for Illustrated Bulletin new and used parts for Harleys. Latest methods of precision motor rebuilding service. Estimate for stamp. Tulsa Motor and Cycle Company, Tulsa, Oklahoma.

**REBUILT** Motorcycles, all makes, new and used. Harley Davidson parts. Send 10c for bulletin. Western, 914 E. 15th, Kansas City, Mo.

**SEND 15c** For illustrated used motorcycle catalog. Bargains. Largest stock genuine Indian parts and motorcycles. Indian Motorcycle Sales, Kansas City, Mo.

**MOTORCYCLES**—Direct to you at rock-bottom wholesale prices. Rebuilt, roadtested and guaranteed Indians, Harleys, etc. Send 10c today for "Bargain Bulletin 43." Crandall Hicks Co., 780 Commonwealth Avenue, Boston, Mass.

**MOTORCYCLE** Bargains, lowest prices, bargain sheets for stamp. Motorcycle accessories. Rochester Harley Davidson Corp., 129 West Main St., Rochester, N. Y.

**HENDERSON, Excelsior, Harley, Indian.** used parts, alloy pistons, catalogues and wings plan 10c. Ballak, 1115 Chestnut Street, St. Louis, Mo.

### AVIATION

**PRACTICAL** Course in aerobatics, \$1, complete, 200 planes, \$70 up, terms. Directory 25c. Aircraft Directory, Athens, O.

**FOR** Aviation training under our apprenticeship plan, see page 28A.

**Big** Assortment of model airplane samples 10c. Aero Shop, 3050 Huribut, Detroit, Mich.



**BUILD** The Heath Parasol, \$199.00. First group \$12.00. Motors \$50.00 up. Sale folder 10c. Ten different Heath folders, 25c. Heath Aviation, Benton Harbor, Michigan.

**QUALITY** Propellers: Harleys, \$3.50; Hendersons, \$3.00; 3' auto special, \$7.00. Hibbs, Fort Worth, Texas.

**USED** Airplanes \$75.00 and up. Easy payments. Literature 10c. Continental, Box 344, Dept. 2, Indianapolis, Ind.

**GET** into aviation. Air transport pilots get up to \$7,000 per year; mechanics, \$2,500. Learn at this government approved school. Write for complete information. State a/c. Lincoln Flying School, 2004 Aircraft Building, Lincoln, Nebr.

#### BATTERIES, GENERATORS, ETC.

**WIND** Driven battery charger plans, parts. Send 10c for list. Millers Radio Service, 1031 S. Washington, Wichita, Kansas.

**FASCINATING** Profitable business. Build amazing electric plants cheaply, from washer engines, automobile generators and parts. Operates lights, washer, radio. Instructions, illustrated circular, business plan, wholesale catalogue 25c. Operate washer with automobile generator. Instructions 25c. Electric Manufacturing, St. Paul, Minnesota.

**AMAZING** Profitable business. Build new farmlight, automobile batteries from old. Recast new plates, all lead castings from junk batteries. Battery Laboratories, St. Paul, Minnesota.

**COPYRIGHTED** Plans for building powerful charger 25c. Wind Electric, Bonilla, South Dakota.

**EXTREMELY** Simple windcharger governor, blueprints 25c. Earl Magnusson, Backus, N. Dak.

**LIGHT** Plants, forty dollars. Don't miss this. Those that want the best in wind electric send one dollar. Have tenfold. Louis Gerard, Willow River, Minn.

**EDISON** Storage batteries for power and lighting systems. Especially adapted for all make plants. The ideal battery for wind driven generators. Replace your old batteries with Edisons. Rugged construction. Non-sealed. No sulphation. Fifteen year life. Five year unconditional notarized guarantees. Complete generating plants. Free illustrated literature. "See Jay Battery Company." 82 Sterling Avenue, Yonkers, New York.

**EDISON** Storage batteries for light-power plants. Non-acid, non-sulphating. Long life. Fully guaranteed. Low priced. Also attractive bargains in power-light plants, generators, motors, etc. T. Hawley Smith Company, Croton Falls, N. Y.

**HARNESS** Wind. Simplest wind plant, direct drive. No turntable, gears, belt, cut-out or rewinding. Charges below 100 r.p.m. AC-DC, 6/32 volts. Complete plans 75c. Main Electric, Hollis, Kansas.

**GENERATOR** Propellers, expertly designed at factory prices. Hibbs, Ft. Worth, Texas.

**6-32 VOLT** Wind electric plants. Kits \$10.00 up. Parts catalog, plans 25c. Currier Mfg. Co., Minneapolis, Minn.

**ELECTRIC** Lights—Wind driven—You build them. Write Wind Motor Electric, Ridgway, Mont.

#### ELECTRICAL SUPPLIES—EQUIPMENT

**HUNDREDS** Of new and rare items, replacement parts and supplies. Send 3c for new, 60-page, wholesale catalog. Autopower, 498-B S. Hoyne Avenue, Chicago.

#### WELDING AND SOLDERING

**ALUMAWELD** Solder will successfully solder aluminum, die cast metals, cast iron and stainless steel. Sold with money back guarantee. Write for information or send 50c for test kit. Alumaweld, 2444 South Parkway, Chicago, Illinois.

**ARC-WELDING** Tool \$1.00. Stamp brings free welder offer. Dickerson Manufacturing, Springfield, Missouri.

**DEMONSTRATORS**, Electric arc welders. Money-saving prices. Used by the government. Trial and terms guaranteed. Hobart Welders, M-403, Troy, Ohio.

**OXY-ACETYLENE** Welding outfits on easy payment plan. Box 331, Hamilton, O.

**300 AMPERE** Welding generator. Fine condition \$150.00. Wilmet Auto Supply, 1970 Wilmet St., Chicago.

**WELDING**, Soldering, brazing outfits \$6.00 to \$49.00. Superior Oxy-Acetylene Company, Hamilton, Ohio.

**ARC-WELDING** Outfit \$1.25. Weld fenders, bronze, solder. Lavrow, 4369-W, Warren, Detroit. Stamp appreciated.

#### ENGINES, MOTORS, DYNAMOS

**GOVERNORS** Control speed of any make of auto engine, regardless of load changes, when used for stationary or portable power production. Read our ad on page 146A. Candee-Smith Governor Co.

**ELECTRICAL** Supplies, motors, grinders. All sizes—best makes. Bargain price—list free. Mailorder Electric Co., 153 N. Desplaines St., Chicago.

**GOVERNORS** Built from auto generators. Complete blueprint and instructions 97c plus 3c tax. W. S. Hoover, Box 127, Killbuck, Ohio.

**FOR** Sale—Small elec. motors, high speed, 1/10 h.p., 110 volts, universal. Reworked, \$1.50 postpaid. L. McConnell, 1619 Edgewood Ave., Racine, Wis.

**TEN** 1/2 Hp. GE motors, 60 cycle, 110 volts, like new, \$9.50 each. Send \$2.00, balance C.O.D. Erie Electric, 120 Church, Buffalo, N. Y.

**WINDING** Data, 100 AC motors, various horsepower and voltage, \$1.00. Motor Data Co., 3002 Monroe, Kansas City, Mo.

**GAS** Engine, 1"x1 1/2", 2 cycle. Complete with carburetor and distributor. Build it yourself from tubing and solid stock. No castings required. Blue prints, actual size, give complete details and bill of materials. Mailed postpaid, \$1.00. W. A. Lyon, 20155 Greeley, Detroit, Mich.

**25 SLIGHTLY** Used 1/2 horse alternating motors \$9.85. 1/4 horse new General Electric \$5.90. 1/4 horse Universal motors \$1.95. Wilmet Auto Supply, 1970 Wilmet St., Chicago.

**THREE** To ten KVA alternating generators. Motors, converters. Queen City Electric, 1736 Grand Avenue, Chicago.

#### MACHINERY, TOOLS AND SUPPLIES

**TREMENDOUS** Surplus of factory tools selling out. Drills, taps, dies, hacksaws, etc. Send for free list, include six cents postage. Travers Tool Co., 264 Jackson Ave., Long Island City, N. Y.

**LATEST** Design 8 inch bench saw. Write for full information. Paul Rodin, Lake Mills, Wisconsin.

**BUILD** Portable electric drill and grinder. Particulars, stamp. Chas. Cochran, 621 Hamilton, Farrell, Pa.

**MECHANICS** Floor and bench vice. Holds firmly for planing and trimming. Should be in every mechanics kit. Postpaid \$1.00. Wm. H. Brerley Agency, 112 West Ninth Street, Los Angeles, California.

**SPRING** Winder, best on the market. Circular 10c. John Blauer, Box 163, Sharon, Pa.

**BARGAINS**, Demonstrators, electric arc welders, guaranteed, 30 days trial and terms. Write Ken's Equipment, Box M-404, Troy, Ohio.

**KELLOGG** Air compressors, excellent condition, \$0.90. Taylor, 105 East 192nd Street, New York.

**ELECTRIC** Drills, New, \$5.95 up. Descriptions sent. Shaw, 31-A4 Winchester St., Boston, Mass.

**LAWN** Mower sharpening made easy. Build our lawn mower vises and stand. Blueprints, photos instructions, \$1.00. Engle & Wirt, West Burlington, Ia.

**SPRINGS**, Assortment of fifty—\$1.00. Wright Spring Works, 5618 Huron Street, Chicago.

**50—1/2 HORSE**, 110 Volt, Universal motors equipped with 14 to 1 gear reduction \$2.50. Wilmet Auto Supply, 1970 Wilmet St., Chicago.

**14" x 5'** LODGE & Shipley lathe, quick change, good condition, price \$175.00. 14" x 6" Monarch, quick change, good condition, \$150.00. 14" Steptoe crank shaper, \$125.00. All sizes of machine tools. Terms to suit. Cincinnati Machinery & Supply Company, 27 W. Second Street, Cincinnati, Ohio.

#### BOATS, OUTBOARD MOTORS, ETC.

**BUILD** Your own boat. Save two thirds, use our ready cut semi-assembled materials. Send 25c for catalog. Brooks Boat Co., Inc., P. 20, Saginaw, Michigan.

**OUTBOARD** Motor mart. New motors from \$39.50, used \$20.00 up. Parts, new and used, all makes. Motors bought and exchanged. 10c brings used motor catalogue. No. 215 Atlantic Ave., Boston, Mass.

**FORD** Marine conversion parts and kits. Models A, B, V8 (domestic or foreign). Catalogue 10c. Osmithson, 3101 C St., Philadelphia, Pa.

**DUCK** Boat. Latest sportsman's design. Light. Sturdy. Easy to handle. Any one can build. Inexpensive. Complete plans free. Masonite, 111 W. Washington, Chicago.

**BUILD** A Kayak from our cut-to-fit kit. Single or two-passenger. \$8.45 up. Everything furnished. Parts guaranteed to fit perfectly. Mail dime for literature. Refunded with order. Jamestown Specialty Co., 377P Titusville, Pa.

**CRESCENT** Sail boats, 13 1/2 x 5' sloop. Write for circular. Jeslek Boat Co., Macatawa, Michigan.

**12-FOOT** Flat bottom rowboat—complete plans 25c. Free boatbuilding catalog. The Rudder, 15 Murray Street, New York.

**1936 MODEL** Outboard motors at bargain prices. Regular retail prices smashed. Marine Store, Sac City, Iowa.

**BUILD** Your own boat. Use Welch boat parts. Caulking cement, repairing materials. Welch Boat & Supply Company, Station K, Milwaukee, Wisconsin.

**OUTBOARD** Parts—New or used—All makes—What do you need? Crandall-Hicks Company, 782 Commonwealth Avenue, Boston, Mass.

**PROPELLERS**, Stuffing boxes, gear pumps, bearings, etc. Wm. Baker, Pond St., Quincy, Mass.

**BUILD** Your own boat. Our fabricated materials save you 75c. Describe requirements and let us quote. Illustrated catalog 100 boats 10c. Ray City Boats, Inc., 1552 Adams, Bay City, Mich.

#### SPORTING GOODS, GUNS, FISHING TACKLE, ETC.

**HUDSON** Bay blankets, Indian pack baskets, camp stoves, knives, compasses, outdoor equipment. Free catalog. Howe Fur Co., Box P, Congers Mills, Maine.

**FISHERMEN**, Free new 1936 catalog showing many new and improved items for fly and leader makers, all that is new in tackle. Paul H. Young, 8005-3 Grand River Ave., Detroit, Mich.

**MAKE** Dipsles for use or sale. Free folder. Reading Instrument Co., Box 78, Reading, Pa.

**COMPLETE** Line fly tying materials. Prices free. Work Fly Co., Pueblo, Colorado.

**BAMBOO** Fishing rods—Build or repair—Save half cost. Send 25c (coin) for "Bamboo Rod Making"—Most complete book, covers all details. Don A. Bell, 1408 Isabella St., Wilmette, Illinois.

**FISH** Bite like hungry wolves with my amazing fish bait. Secret formula \$1.00. Baer, 5007 Magnolia, Chicago.

**POCKET** Weapon 40cl. Powerful, accurate. Catalog 3c. Grant Sportgoods, B51, Detroit, Mich.

**DOG** Collar nameplates (heavy brass). Name, address, 20c; three 40c. Rivets free. Hy-Grade collar with nameplate 60c. Milliken Stamping Company, Olneyville, Rhode Island.

**GUNSMITHS'** Secrets—Bluing, checkering, engraving, etc., 25c. International Agency, Cincinnati.

#### FIELD GLASSES, TELESCOPES AND MICROSCOPES

**TELESCOPES**, Microscopes, binoculars. Lowest prices. Optical catalog free. Brownscope Company, 234 Fifth Avenue, New York.

**BUILD** Reflecting telescope catalog free. Instructions ten cents. Optical Laboratories, Larchmont, New York.

**LITTLE** Scientist microscope outfit, \$1. Educational. Entertaining. Daufeldt, Atchison, Iowa.

**BARGAINS!** Telescopes, microscopes, binoculars. Catalog free. Teeko, P515, Evanston, Illinois.

#### ANTIQUES, RELICS, INDIAN GOODS

**FREE** Circular: Indian relics, antique, fregues, trophies, fossils. Museum, Rutland, Illinois.

**LEARN** To cut and polish semiprecious stones. Complete plans, details. Book \$1.00. Home Lapidary Shop, Madera, Calif.

**ARROWHEADS**—\$3.00 Hundred. Rare warpoint 25c. Large spear 50c. Knife 25c. J. Townsend, Delmont, Pa.

**5 ARROWHEADS** 20c. 3 Birdpoints 10c. Knife, birdpoint, scraper, spearhead 45c. Catalogue. Coins, Minerals, Curios. Lemley Curio Store, Northbranch, Kansas.



**ANTIQUE Firearms, Indian relics.** Lists free. Antiques, 8P South 18th, Philadelphia, Pa.

**100 GOOD Arrowheads \$3.00.** List 3c. H. Daniel, Dardanelle, Arkansas.

**ANTIQUE Guns, Indian relics.** List five cents. Elmer Ellis, Webster Groves, Mo.

### TAXIDERMY

**BIGGEST Bargain.** Complete home course. (7 easily read books, 40,000 words, full illustrations). Makes mounting animals, fish, tanning, novelty-making, simple. \$1.00 postpaid. Formerly sold for \$15.00. Written by south's noted taxidermist. 30,000 books sold last year. Satisfaction guaranteed. 7 books, life membership, diploma, all \$1.00. Schmidt School of Taxidermy, Dept. G-4-3, Memphis, Tenn.

**NEW Catalogue free.** Glass eyes, head-forms, everything for taxidermist (18x14 deerhead shields, \$5c). Write Taxidermic Manufacturers, Memphis, Tenn.

**LEARN Taxidermy** five courses, supplies. Blue Beaver Taxidermy School, Lemont, Ill.

**PAPIER Mache,** largest line of deer head forms, elk, moose, goat, sheep, rug head forms. Full line of taxidermist supplies. Papier Mache Specialties Co., Reading, Michigan.

**TAXIDERMY Supplies—Quality artificial eyes, teeth, genuine Jonas head forms. Tools, materials, etc.** Everything for the progressive taxidermist. Send for big illustrated catalogue—Free. Jonas Bros., 1049 Broadway, Denver, Colorado.

### DOGS, BIRDS, POULTRY, PETS

**4,000,000 CHICKS** Annually. This huge volume has been reached in the short space of fifteen years. Here is the answer. We have only highest quality chicks, that are hatched in the most modern and scientific incubating equipment. Our chicks live, they grow, feather quickly and make you a profit. Repeat orders from our customers and their neighbors have been so heavy that we have increased our output each year right through the depression. Order Davis Chicks this year and be sure of success and profits. Only one grade—my best—(sexed or unsexed, whichever you prefer). For immediate shipment: Barred, Buff, White Rocks, S. C. Reds, White Wyandottes, Buff Orpingtons, White and Buff Minorcas \$8.45—100, \$21.00—250, \$41.75—500. (English) White Leghorns, Buff, Browns and Anconas \$7.95—100, \$19.75—250, \$39.25—500. Heavy mixed \$7.40—100. Assorted \$6.90—100. We pay postage, guarantee 100% live delivery and give additional protection for 14 days. Catalog free. Davis Poultry Farm, Ramsey, Indiana, Rt. 24.

**52 BREEDS.** Bargains hand-picked chicks, baby turkeys, started chicks, hybrids, pullets, cockerels; Iowa inspected. Wonderful poultry book free. Berry's Farm, Route 23, Clarinda, Iowa.

**POULTRY Tribune—Leading poultry magazine.** Five years \$1.00; one year trial 25c in U. S. Poultry Tribune, Dept. C-93, Mount Morris, Illinois.

**SEYMOUR Chicks** from big eggs and blood tested stock, guaranteed for 14 days. For immediate shipment: Barred, Buff, White Rocks, Reds, Orpingtons and Wyandottes \$7.45—100. (English) White Leghorns, Buffs, Browns, Anconas \$6.95—100. Write for circular. Seymour Electric Hatchery, Box 39, Seymour, Ind.

**BEAUTIFUL Chow puppies** friendly and housebroken. Schall's Kennels, Sterling, O.

**SAINT Bernard puppies—like baby bears!** Photographic catalogue, souvenir postcard 10c. Royal Kennels, Naperville, Que.

**RAISE Angora wool rabbits.** Wool worth \$4 pound. Scotch collie dogs. Beautiful specimens. Dr. Armstrong, Albert Lea, Minn.

**IMPROVED Breeder house.** Modern design. Ideal for efficient brooding. Light. Sturdy. Movable. Easy to build. Complete plans free. Write Masonite, 111 W. Washington, Chicago.

**YANKEE Terriers, also bull pups.** Bull-dogs, 501 Rockwood, Dallas, Texas.

**BEAUTIFUL Pure white police dogs.** Ansonia Kennels, Mose, N. Dak.

### FARMS AND FARM LANDS

**TEN Acre fruit, poultry farm; new buildings; near Lake Michigan town; \$900.** Pay \$15.00 monthly. Hill, 127 N. Dearborn, Chicago.

**STROUTS** New spring catalog, world's greatest farm list. Many pages absolutely new bargains; equipped farms, country homes, highway businesses, from Maine to California. Sure money-saver; don't buy without it. Card today brings free copy. Strout Agency, 255-P 4th Ave., New York City.

**CANADIAN Tax sale lands** for a dollar an acre and up; small monthly payments. Farms, timber, hunting and fishing camps, minerals. Limited number of properties. Write at once for free illustrated booklet. Tax Sale Service, Room 613, 72 Queen St. W., Toronto, Canada.

**FARMS—Central Minnesota.** Low prices. Established 1880. Murray, Wadena, Minn.

**THE Great Northern** serves an agricultural empire of fertile productive farms where rents, prices and operating costs are low in Minnesota, North Dakota, Montana, Idaho, Washington and Oregon. Write for free book and full information. E. C. Leedy, Dept. 1357, Great Northern Railway, St. Paul, Minnesota.

**NEW Opportunity!** Farm income is up. Good land still at rock bottom prices. Washington, Montana, Minnesota, Idaho, North Dakota, Oregon. Ask about extensive northwest developments under construction. Literature, impartial advice. Specify state. J. W. Haw, 119 Northern Pacific Bldg., St. Paul, Minn.

**\$5 DOWN, \$5 Monthly,** 20 acres in Missouri Ozarks, \$100. Fishing, hunting, trapping. Hubbard, 219 Grossman Bldg., Kansas City, Kansas.

### TREES, SHRUBS, ROOTS, HERBS

**10 BEAUTIFUL** Evergreens and plants from the Colorado mountains prepaid to you for only \$1.00. 1 Rocky Mountain Blue Spruce—4 year old; 1 Mountain Dwarf Pine—3 year old; 1 Douglas Fir—3 year old; 1 Colorado Silver Spruce—3 year old; 1 Rocky Mountain Blue Delphinium, blooming size; 2 Mountain Viola—the winter pansy; 1 Rocky Mountain Shasta Daisy; 1 Kinnikinnick—red bearded evergreen. Plant now. Prepaid for \$1.00. Rocky Mountain Evergreen Co., Evergreen Colorado.

**FREE!** Send for this amazing new "Herbalist Almanac." Interesting! Instructional! Educational! Contains over 200 valuable herb medicine recipes and Indian secrets for home use. Beautifully illustrated in natural colors. Needed every home. Dime covers postage and handling. Write today! Botanica, 145 West 112th Street, Chicago.

### PROFITABLE OCCUPATIONS

**RAISE Giant bullfrogs—Use pond, swamp, creek.** Big demand—big profits. Our complete 1936 book covers every phase of frog culture from egg to market size. Chock full of boiled down experiences, tried plans, and helpful suggestions of pioneer frog raisers. Send 50c (coin). Ohio Frog Industries, 43-A1 Steubenville, Ohio.

**"SELLING Your Rabbits"** book of valuable new plants. Fifty cents. Hemphill, Vista, California.

**RAISING Jumbo frogs.** Interesting. Big future. Females lay 10,000 eggs. Free literature. American Frog Industries, Box 336, Rayne, Louisiana.

**"FROG Raisers needed!"** Start backyard. Write for free frog book. American Frog Canning Company, (153-D), New Orleans, Louisiana.

### OLD BOOKS WANTED

**WE Pay up to \$5,000 each** for old books; also high cash prices for old magazines, letters, newspapers. A single story book, school book, old Bible, travel book, almanac, etc., that books worthless may bring you \$50, \$100, \$500 or more cash. Thousands wanted! A small town barber discovered a valuable edition of "Pilgrim's Progress" and sold it for \$4000. Two boys playing in an old barn found a valuable edition of "Venus and Adonis" for which we pay \$5000. Send 10c now for big price list. American Book Mart, 140 S. Dearborn, Dept. 513, Chicago.

### BOOKS AND PERIODICALS

**FREE!** Big catalog describing hundreds of books on various subjects. Franklin Publishing Company, 800 North Clark Street, Dept. 2102, Chicago.

**BUILD Your own boat—New book** gives plans, methods, etc. 312 pages \$3.00. Popular Mechanics Press, 200 E. Ontario St., Chicago.

### PICTURES AND POSTCARDS

**SINGLE Picture stereoscope.** Booklet for stamp. No-Mirror Co., Bridgeport, Conn.

### GAMES AND ENTERTAINMENT

**PLAYS, Operettas, musical comedies,** complete minstrel first-parts with song programs, blackface skits, vaudeville acts, monologues, dialogues, recitations, juvenile plays, and songs, musical readings, entertainments, make-up goods. Catalog free. T. S. Denison & Co., 623 So. Wabash, Dept. 11, Chicago.

### MAGIC TRICKS, PUZZLES, JOKER NOVELTIES

**84 MYSTIFYING Card tricks,** 10c. Explained in simple language, illustrated. Book coin tricks, 10c. Book 153 parlor tricks, 10c. All three books, 25c. Catalog free. Franklin Publishing Company, 800 North Clark Street, Dept. 2202, Chicago.

**MAGIC Catalogue** 20c. Lynn, 105 Beach, Dept. 3, Jersey City, N. J.

**MAGIC Trick cards, list and mystifying card trick,** 10c. George Fenner, 2401 Jefferson, Louisville, Ky.

**25 MAGIC Chemical tricks** 25 cents. Perfume Laboratory, Wampum, Pa.

**SENSATIONAL Illusion,** spiritual effect, creates mysterious clouds anywhere, performed by anyone, materials, information, 50c. Steiner, 712 Ave. O, Brooklyn, N. Y.

**HORROR** In a box. Tame your nosy friends and thrill the ladies with this finger joker, 25c coin. Great for April Fool. Chuck's, Box 294, Meriden, Conn.

**200 PUZZLES** With triangles, stars, horse-shoes, cubes, etc., 10c. Franklin Publishing Company, 800 North Clark Street, Dept. 2500, Chicago.

**JOIN Magicians' fraternity!** Monthly magazine, sample 10c (contains many tricks). International Magicians, Mount Morris, Ill.

**1103 Illustrated folder catalogue** latest tricky novelties 10c. Fraber, Box 35, Fort Hamilton, Brooklyn, N. Y.

**MAGIC And mysteries** 25c postpaid. Illustrated book catalog 5c. Witt, 1802 St. Joseph Ave., St. Joseph, Mo.

**NINE Magical effects,** \$1.00. Sure to please. Strand, 1943 N. Tripp, Chicago.

**TRICK Catalogue,** illustrated, 10c. Oaks Magical, Dept. 548, Oakbrook, Wis.

**AMAZE And mystify!** Be popular entertainer. No skill required. Two new books explain, describe hundreds baffling tricks you can do. "50 Mysteries Magic" and "Book 1000 Wonders," marvelously illustrated, bound together, both postpaid 10c. Name free. Send today! Lytle Douglass, Station A-5, Dallas, Texas.

**LEARN Ventriloquism,** 3c stamp brings particulars. Smith, 125 North Jefferson, Peoria, Ill.

**LARGE Professional magic catalogue,** 25c. Holden, 220 W. 42nd St., New York.

### RARE COINS

**OLD Money wanted.** Will pay fifty dollars for 1913 Liberty head nickel (not buffalo). I pay cash premiums for all rare coins. Send 4c for large coin folder. May mean much profit to you. B. Max Mehl, H Mehl Bldg., Fort Worth, Texas.

**\$5000.00 EACH** For rare coins. We guarantee to pay the world's highest prices. Old cents up to \$2000.00 each, 1800 cent \$50.00, Cents of 1861, 1860, 1870, 1881, 1890 \$20.00 each; 1850, 1866 to 1875, 1000 \$10.00 each; 25c before 1916 \$300.00; 50c before 1916 \$750.00; Lincoln cents before 1932 \$35.00 per 100. Paper money \$20.00, foreign coins, half cents, half dimes and thousands of others up to \$2500.00 each. Send dime for large illustrated list before sending coins. Romano's, Dept. 504, Springfield, Mass.

**2 COINS, 4 Notes—different—big bargain** list, all 10c. Hubert W. Carcaba, St. Augustine, Florida.

**FREE!** Foreign coin, banknote, and large illustrated coin catalogue. Send 4c postage. Coin approvals sent. Tatham Coinco, Springfield-125, Mass.

**50,000 RARE Coins, medals, papermoney.** Lists free. Nagz, 8P South 18th, Philadelphia, Pa.

**LARGE Cents at bargain prices.** L. Gibson, Bandana, North Carolina.

**20 COINS** 25c, 100 Coins \$1.00. Otto O'Brien, 10628, Kansas City, Mo.



**THREE** Different sales tax tokens and coin list 10c. German encased postage stamp 25c. Joseph Coffin, 1182 Broadway, New York.

**ROMANO** Pays the world's highest prices for old coins, paper money, encased stamps. Important! Notice our full page advertisement on page 29A.

**15 DIFFERENT** Coins, including United States before 1870, 25c; 99 different \$1.00. Coin Exchange, Box 2354, Kansas City, Mo.

**\$2,500.00 FOR** Certain old pennies! Indian heads \$200.00; Lincoln heads \$27.00. We buy all old money. Highest prices guaranteed. Some \$0,500.00. Catalogue 10c. Federal Coin Exchange, Columbus, Ohio.

**UP TO \$1,000** each for U. S. coins and stamps over 10 years old. New buying list. 10c. Coin-Stamp Shop, Box 37-P, Ottawa, Ill.

**1909 CENT \$10.** We buy all coins rare and common. Some worth \$6,000; 1864-1865 Indian head cents \$100 each; dimes before 1895, \$450; liberty nickels before 1914, \$300; large pennies \$2,000; encased postage stamps \$13; half cents \$275; half dimes \$175; quarters \$300; fractional currencies; paper money; gold dollars \$1,500; colonial coins \$300; silver dollars \$4,000; 1933 50c, \$4; foreign coins \$165, etc. Send 15c today for big 1936 illustrated catalog before sending coins. National Coin Company (P77), Springfield, Massachusetts.

**UNITED States** commemorative half dollars. Columbian 60c; Lincoln \$1.19; Stone Mountain 59c; Lexington \$1.29. Bargain selling price list and California 50c gold token 25c. Arrey, Muskogee, Okla.

**COIN Collectors:** Read "The Numismatist," interesting monthly. Trial subscription, including booklet, six months \$1.00. American Numismatic Association, Suite P, 95 5th Ave., New York.

**COMMEMORATIVE \$2s.** Lincoln, Patriot, Sesquicentennial, Oregon Trail, Maryland, Arkansas, San Diego \$1.50 each. Eighty page catalogue 10c. Norman Shultz, Salt Lake, Utah.

**RAKE** United States, foreign coins, war medals. Catalogue 10c. Mengelle, Colorado Springs, Colorado.

**UNITED States.** Large cent, 2c bronze, 3c nickel and bargain list, 25c. Thirteen dates large cents, \$1.00. George P. Coffin, Augusta, Maine.

**\$5.00 TO \$500.00** Each paid for old coins. Keep all old money. Send 10 cents for illustrated coin value book, 420. Guaranteed prices. Buying and selling. Coin Exchange, Box 5, Le Roy, N. Y.

#### STAMP COLLECTING

**U. S. PILGRIMS.** \$1.50 set. Pairs and blocks accordingly. A. Axelson, P-1914 Oakdale Avenue, Chicago.

**WORLD'S Largest** triangle! Giant Spain triangle and bi-colored Persia airmail; big packet 25 different Russia (catalogue value nearly \$1.00); packet British Colonies including Egypt, Travancore, Ireland, Malay, etc. Big United States list. All for only 5c to approval applicants. Rich-Field Stamp Company, Dept. 20, McLean, Virginia.

**FREE—A** handy watermark detector with each order for fifty British Colonies and fifteen U. S. commemoratives. Price twenty-five cents. In coin, no stamps please, will bring them by return mail. Wilbur M. Pfling, South Mountain, Pa., Franklin Co.

**RARITIES!!** Afghanistan beauty! Dominican bridge stamp; large Greece charity; mint Cayman bicolor; scarce Syrian airmail; three jubilees; packet old U. S. revenues; all for 5c with approvals. Trident Company, 2017 McKean Avenue, Baltimore, Maryland.

**DON'T Miss** this! Big packet of stamps from Egypt, Siam, Turkey, Persia, etc., free to approval applicants who enclose 3c postage. Florman Stamp Market, B-128, Onekama, Michigan.

**ASSORTMENT** British Jubilees (in demand), set Ethiopia (pictorial), Western Samoa (new beauty), Afghanistan (scarce), Russian Hunger stamp, also Costa Rica, Honduras, Guatemala, etc. All only 10c to approval applicants. Union Stamps, P. O. Box 134, Toledo, Ohio.

**UNITED States—Elaborate** priced list free. 45 different 10c, 75 different 30c. Seldenberg, Baroda, Mich.

**SCARCE** Baden (old German state), ex-otic Mongolia, Turks, Calcos, \$5 U. S. giant bi-colored Caymans, imperforate park; absolutely free to approval applicants enclosing 3c postage. Viking Stamp Company, Williamsburgh Bank Building, Brooklyn, N. Y.

**A BIG Bargain—All** for only 55c. Stamp album, providing spaces for 2200 stamps with 700 illustrations, packet of 500 different stamps, 500 hinges, and millimetre measure. Free with each order our pamphlet which tells "How To Make A Stamp Collection Properly," and our price list of albums, supplies and hundreds of bargains in sets and packets. Queen City Stamp Company, Room 35, 604 Race Street, Cincinnati, Ohio.

**TWO Fine** airmail triangles—Island triangle and new bi-colored Mozambique triangle, and fine packet including Ubangi, Chad, Gabon, Indat, St. Pierre, Togo, Senegal, Saragies, ships and animal stamps. Only 5c to approval applicants. Potomac Stamp Co., Dept. 104, Washington, D. C.

**TRIANGLES—New** bi-colored Mozambique airmail triangle; Bolivia and Guatemala triangles, smallest in the world; and the attractive Costa Rica triangle. All four "hard-to-get" triangles for only 5c to approval applicants. Arlington Stamp Co., Dept. 104, Bethesda, Md.

**SMALLEST Stamp! Airmail! Pictorial!** 65 different stamps from strange countries, (no Europe) including beautiful New Guinea airmail, Zanzibar, Haiti, etc., 10c to approval applicants. Bargain Co., Box 39P, Station H, New York.

**ATTENTION!** Approval applicants. We exchange your duplicates. Write for free introduction packet and approvals. Budie, 6929 West Greenfield, West Allis, Wisconsin.

**JAMAICAN Waterfall,** largest ship stamp; colored occupational, included in packet of thirty different beautiful stamps. 5c to approval applicants. Komler, King, Lancaster, Ohio.

**BIG Bargain** packet, 220 different stamps, 10c with approvals. Northern Stamp Co., Box 365, Iron Mountain, Michigan.

**\$2.00 U. S. Capitol, No. 572,** current postal issue. Catalogue 50c, only 5c, with approvals! Giant U. S. list, free! Tatham Stampco, Springfield, Mass.

**50 STAMPS 1c—Many** obsolete. Album 3c. Bullard, 208 Northampton, Boston.

**WILL Pay \$100.00** for 1924 1c green Franklin rotary perforated eleven stamp (\$1,000.00 if unused). Write before sending. Large illustrated folder 10c. P.M., Box 444, Elyria, Ohio.

**WILL Pay up to \$1,000.00** each for certain United States stamps. We offer cash premiums for early used or unused stamps. Send 10c for profusely illustrated catalogue. Arcade Stampco, 34 Euclid Arcade, Cleveland, Ohio.

**GREEK And Egypt** airmail sets, 3 cents to approval applicants. M. Surorick, Room 10, 5342 South Fairfield, Chicago, Illinois.

**SEVENTEENTH** Wholesale Review—Greatly enlarged, sent free on application. Empire Stampco, Dept. 5, Toronto, Canada.

**WORLDWIDE Penny** approvals that satisfy. McKee, 925 Main, Covington, Ky.

**BRITAIN Jubilee!** Complete set with approvals 15c. "The Stamp Shop," 201 North Dennis, Decatur, Illinois.

**200 MIXED 8c, 1000 Hinges 10c.** Bargains galore. Approvals. Harvey Teeple, Decatur, Indiana.

**WESTERN Hemisphere** packet 10c to approval applicants. Vanderhoeven, 9340 State Road, Cleveland, Ohio.

**DOMINICAN Republic,** 10 different, 10c. (No approvals.) Mission Mart, Brookland, D. C.

**PACKETS, Sets,** approvals, price lists free. John Graf, 1874 Loring Place, New York.

**GOOD British** colonials. Worth while premium to first 100 requesting approvals. Reference please. Caroling Stamp Company, Salisbury, N. C.

**44 DIFFERENT** United States including \$5 stamp, or complete set United States bi-centennials, or 30 different obsolete Canada, 13c postpaid with approvals. C. A. Lennon Co., Box 322, City Hall Annex, New York, N. Y.

**SCARCE** Ceylon jubilee, 26 other British colonials including jubilees. 6c with approvals. Kibbuck Exchange, Wooster, Ohio.

**WHOLESALE** Catalog for dealers. Illustrated. Postage 10c. Frank Co., 4900 Chalmers, Baltimore, Md.

**PENNY Approvals.** 1/2c ea. Book 250. Many high values. Perle Blackmer, Box 275, Oak Park, Ill.

**BEST Penny** approvals. Get yours. Edwin Gelsinger, 7109 Michigan, Detroit.

**3000 WORLDWIDE** Unpicked stamp mixture \$1.25. Frank Strosky, Box 53, Perth Amboy, New Jersey.

**225 VARIETIES.** Cat. \$10.00, only 25c to approval applicants. Tiner, B-589, Pasadena, Calif.

**PRIVATE** Collection discontinued. Send one dollar bill and receive eight times catalogue value different stamps. Quint, 1111 North Astor, Milwaukee, Wis.

**JOIN Our** Build a Collection Club. Trade your duplicates. Get packet service regularly. Fill want list. Pay little a month. Send 3 collectors names and stamp to C. L. Sprague Co., 210PM Fifth Ave., New York City.

**MINT Block 61c 4x6,** 20 Glassine packets. Your name in gold on embossed cover 15c. Grimsland, 117 No. Wells, Chicago.

**GOOD U. S.** approvals, references please. M. Amiel, P. O. Box 1903, St. Petersburg, Fla.

**20 DIFF.** Ship and map stamps, 15c. Approval applicants only. Free price list. Kansas City Stamp Co., Lee Bldg., Kansas City, Mo.

**UNITED States, Canada, Newfoundland, Mexico! Where?** Our "Four Star" approvals. Nothing like them! Write today. Kessels, Box 808, Tucson, Arizona.

**B-A-S-P-O-R-T.** Take a chance, send a dime and see what stamps I shall send you. If not satisfied, dime refunded. A. Anderson, 367 Fulton St., Brooklyn, N. Y.

**EXCHANGE** Stamps, postcards by "Exchangers," 51 Passage Bureau, Paris 126, France. Particulars free.

**NEWFOUNDLAND,** 15 Different 5c with approvals. Hudson Company, Plattsfield, N. J.

**25 DIFFERENT** South American for only 10c, no approvals. Burkhart Stamps, Sandwich, Ill.

**FREE!!** King George memorial packet, 20 varieties. Postage 3c. Roberts, 901F Fourth, Baycity, Michigan.

**FREE!** Beautiful packet including Ecuador, Bolivia, and Chile air mails to approval applicants sending postage. Meyer, Box 94, Newnan, Georgia.

**CAYMAN** Island free with approvals. Herget, Kensington, Buffalo, New York.

**TRIANGULAR** Iceland airmail, scarce Bermuda No. 95, Australia Jubilee, set Nicaragua and fifteen others for 5c, with approvals. Taylor's Exchange, 6122 Woodlawn, Chicago.

**GUARANTEED** Genuine mint set approvals. Charles Hendricks, Hazelton, Youngstown, Ohio.

**ABYSSINIA, Antioquia, Borneo, Congo, Iraq, Jubilees, Liberia, Nyassa, Sudan, Samarino, Southamericans.** Super packet, 10c with approvals. Viasari, Route 4, Scotia, New York.

**U. S.—57** Different (commemorative, airmail, etc.) with approvals 9c. Moseley, 4632 Forestpark, St. Louis, Mo.

**SCARCE** Nyassa triangle; giant Belgium balloon; Egypt and Lebanon airmails; packet British Colonies including rare Borneo, Congo, SanMarino, Cuba, China, Mexico; perf. gauge; watermark detector. 6c to approval applicants. Eureka Stampco, Burbank, Calif.

**100 DIFFERENT 5c,** to approval applicants. Phelps, R1, Box 144A, Royal Oak, Michigan.

**PREMIUMS** With approvals, 3c postage. Harold Bowen, Fort Dodge, Iowa.

**FREE!** Magnificent pictorials, fifty-eight different foreign, Jampur Maharajah, Guatemalan Quetzal, Abyssinia, Caledonian Samurstag, Newfoundland Codfish; New Zealand Pud-fantail, Chilean Andescondor, Mussell; to approval applicants 5c postage. Topmast Stamp Co., 3155 So. Grand, St. Louis, Mo.

**FREE** Premiums—Request our world wide penny approvals. Kokoma Stamp Exchange, Box 607, Kokoma, Indiana.

**TWO** Beautiful silver jubilees from India, also fine packet Nigeria, Egypt, Newfoundland, Mexico, U. S. \$5, \$10 revenues, etc. Only 5c to approval applicants. Maynard Sundman, B100, Box 384, Bristol, Conn.

**WANTED—United States, Canadian** stamps, also collections. Kleinman, Jenkintown, Penna.

**20 BEAUTIES** (\$5.00, jubilee, mourning, commemorative sets) 5c, with approvals. Selther, 1527 No. White, New Orleans, La.

**STAMP Approvals 1/2c** and up. Thomas Seaver, Pine Point, Maine.

**TWO** Cacheted airmail covers, airmail stickers, Missouri sales tokens, 25 revenues, original documents. All 25c. McKay, 7200 Yale, Chicago.



**RECENT Wanderings** have brought to light a trunkful of United States stamps richly represented in old issues, high values, imports, and other attractive items. The stamps are all tied in bundles and are positively unsorted. We split a few bundles and found stamps over sixty years old, some of which registered a high catalogue value. An advantageous purchase enables us to offer these stamps in bundles at 100 for a dollar. We advise you to take advantage of this rare opportunity to enrich your United States collection now, as our supply may not last long at this price. We have a few stamps on original covers which will be given to the first orders reaching us. Adventure Stamp Company, Fox Lake, Illinois.

**TEXAS** Centennial seals, fifty cents hundred. Garland Adair, Austin, Texas.

**ATTRACTIVE** Set cataloging \$1.00. Se. Approvals. English Company, Nashua, New Hampshire.

**300 DIFFERENT** 20c; 1,100, \$1; 2,000, \$2.50. Fred Onken, 930 79th St., Brooklyn, N. Y.

**25 URUGUAY** 10c; 25 Luxemburg 15c; 25 China 10c; 25 Egypt 10c. To approval applicants. Anchor Stamp Company, Bath-erford, N. J.

**THE First** balloon flight stamp issued anywhere in the commemorative of Professor Picard's famous flight into stratosphere in 1932. This beautiful stamp is getting scarcer every year. We will send it together with complete set (6 values) of Denmark's beautiful Viking ships, complete set (6 values) General Juchenitch Russia 1910, complete set (3 values) Victor Emanuel commemoratives of Italy, 1923, all for only 10c to approval applicants. Globus Stamp Company, 268 - 4th Ave., Dept. 50, New York, N. Y.

**FREE!!** Scarce triangle! Set 50-year old U. S. 1. Also packet magnificent pictorials including English Silver Jubilee, famous Spain Goya and New Zealand Kiwi Bird! This \$33 combination absolutely free with bargain approvals! Postage 3c. Midwood Stamp Company, (P6) Midwood Station, Brooklyn, N. Y.

**105 DIFFERENT** Stamps including large Spanish ship, Cameroon, Gabon, Andorra, Azerbaijan, all for 10c to approval applicants. Swedell, 3129 Garfield Ave., Minneapolis, Minn.

**STAMPS**, Half price. What needed? Indian head, Lincoln cents, 10 etc. 5 large cents \$1. Jamieson, Globe Building, St. Paul, Minnesota.

**1000 ALL-AMERICAN** Mixture 25c. Monjar, 1842 Waverly, Cincinnati, Ohio.

**500 FINE** Mixed United States with scarce cover of Civil War period 25c. Approvals. Wright, 1154 Hamilton, Hagerstown, Maryland.

**CANNON!** Set of stamps showing cannon, firing squad, cavalry charge and 200 other different stamps only 10c to approval applicants. Paramount Stamp Co., 4225 Broadway, Chicago, Ill.

**YOU'VE** Tried the rest, now get the best! "Challenge Collection" including Cape Good-hope, triangle, Thessaly octagonal, commem-oratives, 10c with approvals. Free airmail collection, additional premiums given regu-lar customers. Bargain Stamp Service, Box 5147, Los Angeles, California.

**LINDBERGH** 1st Day cover 25c. U. S. pricelist free. Box 835, Minneapolis.

**5000 DIFFERENT** Stamps only \$13.75. Arrow Stamps, Box 453, Meriden, Conn.

**20 LEICHTENSTEIN** 43c To approval ap-plicants. Sodik Stamps, Sioux Falls, S. D.

**BRITISH** Silver Jubilee from 3 different countries, imperforate 3c Eyrd commemora-tive—all included in Clipper packet contain-ing 25 different stamps from Azerbaijan, China, Ukraine, etc. All for only 5c to ap-proval applicants. Clipper Stamp Co., Dept. 7, Gloucester, Mass.

**500 DIFFERENT** 40c; 50 Cataloging \$1.87, 20c. Approvals. W. Booher, 932 Roman, Wilmington, Calif.

**FREE**—Beautiful large Spanish triangle to approval applicants. Ed Goebel, 1207 Harrison, Superior, Wisconsin.

**GIVEN**—One large copper cent at least 80 yrs. old for 5c to penny approval stamp applicants. I Harris, 903 Almond St., Syra-cuse, N. Y.

**FREE**—Beautiful airmails from six coun-tries, to approval applicants enclosing post-age. Green & Co., Norwood, Ohio.

**AIRMAILS**, Jubilees, commemoratives with mammoth tru-value collection sent for 5c—provided you desire our double premium approvals. Tru-Value Stamp Service, Box 1412, Hartford, Connecticut.

**ILLUSTRATED** U. S. Hist. price 50c, large complete U. S. price list free. Send postage. Stanley Gibbons, 38P Park Row, N. Y.

**50 DIFFERENT** Canada 30c; 80 different United States 25c. Chas. Reitter, Box 329, Chicago.

**1000 ALL** Different stamps \$1.00 post-paid. Arnold Crohl, Manitowoc, Wis.

**FREE!!** Scarce Paraguay and Brazil air-mails! Set Charidhari pictorials! Also Al-geria, Congo, Newzealand, Guinea, Gabon, many others—3c to approval applicants. Hunziker, Box 225P, Minneapolis, Minn.

**1000 U. S.**, including precancels, commemo-ratives, etc., 20c. Lee, Bridgeport, N. Y.

**TRIANGLES**, Octagons, airmails, com-memoratives, plus 50 stamps, 50 countries, ten cents to approval applicants. Pioneer Stamp Shop, 234 Main, El Monte, California.

**1/20th CATALOGUE** Value! 50 different stamps from 50 different countries—all for 5 cents to approval applicants. International Stamp Corp., Dept. 51, Newport, R. I.

**FREE**—Queen Astrid mourning stamp with approvals. Ephraim, River Forest, Ill.

**VALUABLE** Mint black bicentennials 15c with approvals. Losbi, 1508 Larrabee, Chi-cago.

**ROMANO** Pays the world's highest prices for old coins, paper money, encased stamps. Important! Notice our full page advertise-ment on page 20A.

**JUNK?** Not in this packet! No sensa-tional trash—rare countries including Bo-livia (1935 map), Transvaal, Georgia, Gwator, Epirus (bicolor flag), Cape Good Hope, Montenegro (commemorative), Orange River, etc. Value, not gas!! Only 5c to ap-proval applicants! Jay Cooper, 2006P Ave-nue M, Brooklyn, N. Y.

**AMAZING** Surprise packet, prices, 25c. Reid Novelty Company, 3817 Graceland, Racine, Wis.

**\$1.00 MONTHLY** Opens New York office with oldest organization. Co-Operative Mail Service, 126 Lexington Avenue.

**OUR** Used new issue packets double value in year. Free bulletin. Nupaka, 379 Grand Ave., Brooklyn, N. Y.

**100 U. S.** Commemoratives, etc., 10c—500, 25c. Box 457, Newark, N. J.

**200 DIFFERENT**, Triangle, airmail, etc., 10c. 1000 mixed United States 25c. R. H. Carlton, Box 5427, Los Angeles, Calif.

**SALE:** 300 Fine stamps 10c. Reflecto-plastic cards the new world wonder 10c. Razor blades 100, 40c. Schollmeyer, Box 35, Lefferts Sta., Brooklyn, N. Y.

**WEEKLY** Stamp magazine, thirteen weeks, 10c. Stamp Journal, Kalamazoo, Mich.

**SNEEZER** Packet—Szechuen, Czech, Kouang-Tcheou, Mozambique and others—5c. Depraw, Ocean Park, Calif.

**FREE**—25 Different United States stamps to approval applicants. 3c postage. Browns Stamp Shop, Flint, Michigan.

**4c EACH** And up on approval. Eisinger, 768M Fox Street, New York.

**FREE**—25 British Colonies with approvals. Harlan, 5307 South Marshfield, Chicago.

**TRY** Mullan for stamps! Approval service to serious collectors. W. L. Mullan, Box 723, Coeur d'Alene, Idaho.

**100 DIFFERENT** 6c. Approvals in sets or by countries. E. P. Johnson, Box 267, Mer-san Hill, Calif.

**25 DIFFERENT** Mexico 7c to introduce new method selling, trading. No approvals. Washburn, Box 1646, El Paso, Texas.

**STAMP** Dealers, your ad here will bring wonderful returns. Ask me for proof. F. W. Johnson, Manager, Classified Advertising, Popular Mechanics Magazine, 200 E. Onta-rio St., Chicago.

**UNBELIEVABLE**—Suriname, Panama, British Honduras, Jubilee, airmail, triangle. Complete collection every country from Straits Magellan to Arctic. 10c. Approval applicants only. Mutual Stamp Service, Box 606PD, Ventura, Calif.

**JUNBO** Approvals—500 to a book; de-signed to meet the wants of advanced col-lectors who have neglected the cheaper stamps. Many fine, new issues. Trial so-limited. References necessary. Reimers, 121 Flatiron, Fort Worth, Texas.

**SCARCE** Triangular Mozambique commemo-rative airmail and packet of 33 U. S. in-cluding imperforate 3c Chicago; early is-sues; high values; commemoratives; enve-lopes; revenues, etc., cataloging more than 75c—only 5c to approval applicants. Illus-trated pricelist free. Curban Stamp Co., Dept. P, Gloucester, Mass.

**FREE!** Philatelic parade. Stamps from everywhere including, commemoratives, pic-torials, air mails. Postage 3c. Request ap-provals. Grandstamps, 619½ South Spring, Los Angeles, California.

**SILVER** Jubilees—15 different 25c. World specials—500 different 35c, 1000 different \$1.00, 2000 different \$3.00. These offers to approval applicants only. List free, Vic-toria Stamp Co., London 4, Canada.

**SCARCE** Airmail and triangle. Beautiful Uruguay "flying horse" airmail and scarce Guatemala triangle (smallest in the world) are included in our big packet of 60 different stamps from Abouites, Grand Liban, Venezuela, British and French Colonies, etc. All for 5c to approval applicants. Big il-lustrated lists free with each order. Write today! Mystic Stamp Co., (Dept. 80), Cam-den, New York.

**ILLUSTRATED** Album, Spaces 4000 stamps; to approval applicants 20c. Swan Stamps, 604 Swan, Dunkirk, N. Y.

**UNITED** States 100 different 25c. Steger, Box 154, Crown Point, Ind.

**STAMPS**, Fine selection sent on approval. Quality at low prices. Fred Herzberg, PM-187 Grantley, Elmhurst, Ill.

**LIBERIA** Triangle, two other triangles, diamond-shaped stamp, silver jubilee, 33 others, 5c. Crowder, 127E North, Balti-more, Md.

**THIS** Ad worth 25c. If you send for our approvals and buy 50c worth or more—large selection of U. S. and foreign—reasonable prices. Morton Stamp Co., 1121 Olive, St. Louis, Mo.

**SCARCE** "New issues" packet! New giant sized, diamond-shaped "sports" stamp from Russia; Nyassaland "leopard"; Sudan camel; Spanish Morocco; Tanganyika, and other scarce countries are included in our big packet of new and recent issues—stamps which most collectors have never before seen! Get this valuable packet today. Only 5c to approval applicants. Reimers, 115 Flatiron, Fort Worth, Texas.

**QUEEREST** Stamp packet! Receive world's smallest stamp; Vatican City; scarce Liberia triangle (value 15c); 1935 Greek Red Cross picturing coiled snake in Garden of Eden; Australian Bushman; new Spanish Morocco; Japan 'quake stamp; Manchukuo; many others. Only 5c to approval applicants. R. M. Stamp Co., P. O. Box 230F, Fort Chester, N. Y.

**FREE**—\$1.00 U. S. stamp, our choice, with request for 52 page price list of United States and foreign stamps. Stamps on ap-proval. References necessary. Special 8 Nic-aragua 1903—30c. New Hussman Stamp Co., 1122 Pine Street, St. Louis, Mo.

**GIANT-SIZED** Russian Zeppelin stamp (cat. val. 20c!) and beautiful Lithuania air-mail triangle; also big packet of 33 dif-ferent stamps including Azerbaijan, Epirus, new Martinique, etc. and illustrated lists—all for 5c to approval applicants! World-Wide Stamp Co., Box 600, Camden, New York.

**PENNY** Approvals, that satisfy. Neil Gronberg, Box 5441-P, Philadelphia, Pa.

**200 DIFFERENT** 10c. Big 50% ap-provals. Covert Stamp, 39 State, Rochester, N. Y.

#### CAMERAS, PHOTO SUPPLIES

**CAMERAS** And supplies. Free illustrated catalog listing everything photographic—still and movie cameras, films, lenses—at tre-mendous savings. Thousands of bargains, new and used. All guaranteed. We take your old camera or equipment in trade. Write now for your free copy of our Photo-graphic Almanac and Bargain Book—just out! Limited edition. Hurry! Central Cam-era Co., (Photographic Headquarters since 1890), 230 So. Wabash, Dept. 9354, Chicago.

**DEVELOP** Your own films, prints. Easy instructions—10c. Larson's Laboratory, PM-3410 North Ave., Chicago.

**CASH** For cameras, Graflex, etc. Liberal trades. Camera Shop, North Market, Can-ton, Ohio.

**"PHOTO** Fun"—Kinks, tricks, money making ideas. 10c. Photocraftsmen, Box 1688, Milwaukee, Wis.

**CAMERAS** With fast lenses at bargain prices. Regular retail prices smashed. Camera Store, Sac City, Iowa.

**MAKE** Money in photography. Learn quickly at home. Spare or full time. Easy plan. Previous experience unnecessary. Common school education sufficient. Write for full information and requirements. American School of Photography, 3601 Mich-igan Avenue, Dept. 343-B, Chicago.



**FREE!!** Sample copy sixty page photographic magazine—interesting, instructive. Pocket Photo Monthly, Canton, Ohio.

**HAVE** You a camera? Send ten cents for recent number of our big magazine, showing how to make better pictures and earn money. American Photography, 118 Camera House, Boston, 17, Mass.

**INCOME** From your camera instead of expense. Low cost home course teaches you to make photographs for magazines, newspapers, advertisers. Tremendous demand. Earn good money wherever you live. Free book. Universal Photographers, Dept. 104, 10 West 33rd St., New York.

**MAKE** Money with your camera. New book tells how. 113 pages illustrated. \$1.50. Popular Mechanics Press, 200 E. Ontario St., Chicago.

#### PHOTO FINISHING

**FILMS** Developed. 2 prints of each 25c; 20 reprints 25c. Fine Photo, M-5134 Nevada, Chicago.

**20 REPRINTS** 25c—Films developed. 16 prints 25c. Enlargements 8x10—25c; 5x7 10c. Low Photo, M-2057 Nevada, Chicago.

**ROLLS** Developed and printed 25c. Quality instead of free enlargements. All prints made on Yelox paper. Cain's Photo Service, Dept. C, 8032 So. Vermont Ave., Los Angeles, Calif.

**VELOX** Prints. Quick service. Send quarter with roll. Reprints 3c each. Photex Co., Box 725A, South Bend, Ind.

**VOGUE** Prints, something new; free samples. Welck Photo, 2840 Zenobia, Denver, Colo.

**BEAUTIFUL** Easter cards from your negatives. 60c per dozen with envelopes. Rolls developed, two sets dated prints plus enlargement coupon 25c. Reprints 3c, over 10 reprints, 24c. Jones Studios, Davenport, Iowa. "Where the West Begins."

**ROLL** Developed. Two double-clear prints each negative 25c. Reprints 24c. Enlargement coupon. Willard's, Box 3535-A, Cleveland Heights, Ohio.

**AMAZING** Value: Send 10c (dime) for two enlargements, 2 1/2x3 1/4 only, made from miniature negatives, rest pocket size (1 1/2x2 1/4) or smaller. Ask for bargain list. Roanoke Photo Finishing Company, 309 Bell Avenue, Roanoke, Va.

**DEVELOP** And print your own pictures. Save time, money with our complete \$1.00 outfit postpaid, or pay postman \$1.10 C.O.D. Includes electric ruby lamp, printing frame, photo paper, chemicals and equipment. One of thousands of amazing bargains in our free Photographic Almanac and Bargain Book. Send for it today! Central Camera Co., Dept. 0354, 230 So. Wabash, Chicago.

**EASTER** Greetings from your negative, hand colored, samples 3 for 25c. Ideal Photo Service, Box 2255, Paterson, N. J.

**FREE!** A two-color embossed snapshot album with every 2 1/2x3 1/4 or smaller roll finished for 25c. Free enlargement coupons given. Enterprise Film Co., Enterprise, Ore.

**TRIAL** Offer. Roll developed and 8 prints 25c. Reprints 3c. Deluxe easel framed 5x7 enlargement 35c. Young Photo Service, 405 Bertha St., Albany, N. Y.

**ROLL** Developed, two prints each, two enlargement coupons 25c. Summers' Studio, Unionville, Mo.

**20 REPRINTS** 25c. Larger orders 1c per print. Trial. Rolls developed and printed 10c. Reliable, River Grove, Ill.

**IMMEDIATE** Service! No delay! Roll fully developed, carefully printed and two beautiful, full-size 5 x 7 double weight professional enlargements (or one tinted enlargement)—all for 25c coin. The experts' choice! Reprints 3c each. The Photo Mill, Box 0202, Minneapolis, Minn.

**ROLLS** Developed, two beautiful Nu-border enlargements, eight Nu-border prints, guaranteed fadeless, 25c coin. Giant Snapshots, Inc., Dept. A, Greenbay, Wis.

**BEAUTIFUL** Glistening prints, roll developed, 8 guaranteed glistening prints, 2 enlargements, 25c. American Photo Ser., 2046-C Nicolet, Minneapolis, Minn.

**20 REPRINTS** 25c. Films developed, two prints each negative, 25c. Skrudland, 6070-8 George, Chicago.

**20 REPRINTS** 25c. 100 Reprints \$1.00. Rolls developed with 16 prints 25c. Nordskog, 4, Maywood, Ill.

**HAND** Colored enlargement with each roll 25c. 40 reprints 50c. Colorgraph, Dunning Station, Chicago.

**FINER** Finishing. Rolls developed and printed. Colored enlargement, or two double professional enlargements all for 25c (coin). Genuine, nationally known. Moentons superior quality. Moon Photo Service, Box P-867, LaCrosse, Wis.

**BEAUTIFUL** Colored enlargement with each film 25c. Speedy service. Satisfaction guaranteed or money refunded. LaCrosse Film Company, LaCrosse, Wis.

**ROLL** Developed and 10 prints 25c. Smart Photo, Winona, Minn.

**ROLLS** Developed. Two beautiful double-weight professional enlargements and 8 guaranteed Never Fade Perfect Tone prints. 25c coin. Rays Photo Service, LaCrosse, Wisconsin.

**TWO** Professional enlargements with each roll developed and printed 25c. Eight reprints, two enlargements 25c. Hyglass, River Grove, Ill.

**ENLARGEMENTS** From miniature negatives (approximately 3x4 inches) 5c each, when ordered from complete roll. Fine grain developing 25c. Fotoshop, Inc., 136A West 32d St., New York City.

**KODAK** Enlargements 5x7, 10c, 3 for quarter, coin. Send best negative (film). Xint Photo Lab., Dept. 5, Cedar Rapids, Iowa.

#### MOTION PICTURES AND SOUND EQUIPMENT

**DE VRY** 35MM Suitcase 500 watt. motor. 1000 ft. projector \$32.50. Steinman printer \$45.00. Hoffman film cleaner and processor \$14.95. Electric razor \$9.75. Revolved set mounted \$3.45. Negative 5"x6" lens \$1.29. Victor 16mm camera \$37.50. Bell-Howell voltage control \$2.10, cement 25c. Leica \$50.00 Rolleiiflex \$39.95. Pathex camera \$3.39. Cine kodak 8mm projector \$24.95, camera \$24.95. DeVry 35mm movie camera, automatic with 3.5 lens \$64.50. Eastman movie camera \$35.00, with 1.9. \$65.00. Turret cameras 50% off. Film library silent, sound. Catalogue. Trades accepted. Mogull's, 1944-J Boston Road New York.

**16MM EXCEL** Motor driven projector. 100-ft. reel \$2.95. Large selection of films including Pop-Kyo and Betty Boop. 3c stamp for catalogue. Excel Home Movies, 622 Madison, Toledo, Ohio.

**16MM ART** Films. Beautiful Hollywood models. \$1.00 for during 20 ft. screen test. 25c for art sample. Projector bargains. 3c brings illustrated catalogue of 16mm or 8mm films and equipment. Hollywood Cine Film Distributors, 1437 No. Highland, Hollywood, California.

**PROJECTOR** And film bargains. Also used books. Clyde King, Waterman, Ill.

**8MM-16MM EQUIPMENT.** Catalogue free. Elder, Dept. R-22, Chelsea, Mass.

**WESTERN** Thrillers—500 feet. 75c. Jersey Films, 2075 Richland, Lakewood, Ohio.

**35MM SILENT** Pictures—\$1.00 reel. Stamp for list. 2037 College, Fort Worth, Texas.

**MOVIE** Films, projectors. Half price. Free list. Montwieler, 10125 Champion, Cleveland, Ohio.

**16MM LIBRARY** Films \$3.50 up. Sound disc subjects \$3.50 up. 100' add film 75c. Hornstein, 29 E. Madison, Chicago.

**200** FILM Buyers name and address \$2.50. Parks, Grapard, Texas.

**8MM COLOR.** 8.8. panchromatic, titling film, for all 8mm cameras, home titling data, accessories, processing, titles. Film Specialties, Box 111P, El Monte, California.

**FILM** Humidors. All steel 8mm, \$5.00; 16mm, \$12.00. Microtex Products, 6241 Southwood, St. Louis, Mo.

**CAMERA.** Film, projector bargains. List. Moorfield-Shannon, Nutley, New Jersey.

**16MM FILMS** Exchanged 25c per 100 ft. Camera, projectors. Black, 1451P Broadway, New York.

**BARGAINS!** 35MM Silent-sound projectors. Films—accessories. Zenith, 308 West 44th, New York.

**8MM. AMATEURS:** Titling film 50 ft. \$1.25. Slitter \$3.00. Reproforming service. Bala, 2110 Feldman, Norwood, Ohio.

**LEARN** Motion picture theatre business. Home-study training; management, advertising, projection. Ninth year. Catalog. Theatre Institute, Elmira, New York.

**CENTRAL'S** Free Photographic Almanac-Bargain Book explains latest movie developments, offers money-saving bargains in cameras, lenses, projectors, films. We take your old camera or equipment in trade. Write! Central Camera Company (Photographic Headquarters since 1899), 230 So. Wabash, Dept. 7354, Chicago.

**BASS** Bargain counter: Write today for your free copy of the latest, greatest Bass Bargaingram No. 219 of 16mm. cine apparatus. Filled with rare bargains, for instance: Keystone 8 mm. camera and projector, latest type, regularly \$69.45, at Bass only \$54.75. 100 ft. 16mm. Mono film including reversing, \$2.05. Wille Cine exposure meter, infallible, \$5.15. 300 watt. motor driven 400 ft. capacity standard 16mm. projector, \$29.50. Bass Camera Co., Dept. A, 179 W. Madison St., Chicago, Ill.

**16MM FILMS** Bought, sold, exchanged. Catalogue, 10c. Fotoshop, 136A West 32, New York.

**AUTOMATIC** 16MM Movie cameras \$5.00 brand new. Order today direct from this advertisement. Projectors \$1.00 up. Films 35c up. Free lists. Home Movies, Box 32, Easton, Pennsylvania.

**HIGHEST** Prices paid for used still-movie equipment. Send description. Fotoshop, 136A West 32, New York.

**DIME** Brings two 16mm. "end" titles, catalogue 16mm. film bargains. Sound, silent rental catalogue if interested. Eastin Platters, Davenport, Iowa.

**16MM CAMERAS** And projectors. A. Hickenbury, Lambertville, N. J.

**8MM FILMS:** Cartoons, travel. List. Lincoln Film Service, Box 293-A, Saginaw, Mich.

**LOOK!** "The World's Greatest Passion Play." 5 reels. (New) 10mm. superior than the Oberammergau stage play, rent or purchase. Write Hemenway Film Co., 37 Church St., Boston, Mass.

**SUPERSPEED** Panchromatic 16mm film, 100 ft., \$3.75. Other films from \$2.10. Bargains in new, used equipment. Send for circular. Fotoshop, 136A West 32, New York.

**100 FEET 35MM.** 27c. Bargain lists 3c. Hoffman Film Service, 57 Broad, Albany, N. Y.

**FILMS.** Projectors. 10c coin for lists. Capital Productions, Rosedale, Kansas.

#### RADIOS, SUPPLIES, INSTRUCTION

**RADIO** Experimenters and set builders: Parts and kits of parts for the TR.F. Four all metal tubes, six tube 32 volt Farm set, Economy Three, Five and Four Tube Improved Little Giant, Auto Radio and Portable Battery set described by Popular Mechanics. Lund Manufacturing Co., 43 East Ohio, Chicago.

**INSTRUCTIONS** 18 Distance crystal sets—record 2100 miles; "Radiobuilder" year. 25c. Laboratories, 151-C Liberty, San Francisco.

**INVENTION.** Control your radio from another room or bed. Easy installation, instructions and remotecontrol \$1.00. Remote-control Company, Dalton, Georgia.

**ANY** Voltage from any battery. Instructions \$1.00. Meehan, Delmar, Delaware.

**"CHINA Clipper"** one tube receiver. Foreign reception guaranteed. Catalog. Radio City Labs., 1222-30 Rockefeller Plaza, New York.

**MISCELLANEOUS** Amateur transmitting, receiving equipment. Photostat. Lane Jackson, Independence, Missouri.

**SHORTWAVE**—Longwave one tube receiver. Powerful! Can receive police, amateur, airplanes, foreign stations, etc. Also regular broadcasts. Guaranteed results! Inexpensive dry battery operation. Metal chassis, panel, and every part needed to build this amazing receiver—only \$1.25, postpaid. Clear instructions, simple to wire and operate. (Laboratory wired—75c extra.) Order now! (Tube—75c.) Send stamp for illustrated circular describing battery and electric models. Ace Radio Laboratories, 1010 Broadway, P-4, New York.

**BARGAINS**—Greatest wholesale radio catalogue. Send 3c stamps. American Sales Company, P44 West 18th Street, New York.

**SENSATIONAL** New low loss pocket radio, complete with phones. \$2.98. Stamp brings details. Bankson & Meals, P. O. Box 92D, Los Angeles, Calif.

**RADIO** Engineering, broadcasting, aviation and police radio, servicing, marine and Morse telegraphy taught thoroughly. All expenses low. Catalog free. Dodge's Institute, Ames St., Valparaiso, Ind.

**RADIO.** All phases. Amateur, shortwave, experimenting, set building, broadcasting, servicing, etc. Complete list recommended books free. Popular Mechanics Press, Room C35, 200 E. Ontario St., Chicago.



## MUSIC AND MUSICAL INSTRUMENTS

**WRITE** Songs right. "Practical Song Writing and Composition," the simple, complete, fully illustrated course shows you how. Has proved highly successful with amateurs. \$1.00 postpaid. Cromat Publishing Co., 5 South Norwalk, Conn.

**VIOLINS**—Make and repair them in spare time. Instructions, patterns, all supplies furnished. Fraser, 2024 Stark, Saginaw, Mich.

**REBUILT** Band and orchestra instruments. Honestly rebuilt—fully guaranteed. Catalog of new instruments on request. Weymann Company, Dept. M-4, 13th and Arch Sts., Philadelphia.

**POEMS**. Music composed. 25 copies furnished and recording of song by Hollywood recording artist. \$37.50. Leftwich Publishing Co., New Orpheum Bldg., Los Angeles, Calif.

**PLAY** Piano by ear at once. You too can have musical hands. \$1.00 postpaid. Leslie Lind, Park Ridge, Illinois.

**WANTED**: Songpoems and melodies worthy of publication. Square deal. Roy Allen, Kitchel, Ind.

**WRITE** Songs. Big money and reputation. Write for information. J. Gordon Pub. Co., 201 N. Wayne Ave., Chicago.

**SONGWRITERS!** Poems—melodies. Special offer. Studio PM, Guarantee Bldg., Hollywood.

**SONG** Writers. Send for our "Publishing Agreement." McKinley Music Printers, 1501 E. 55th St., Chicago.

**SONGS**—Plain paper 5c, folios 35c. Orchestration 35c. Dewey Music Publisher, 9825 Ave. M, Chicago.

**SONG** Poems wanted, 50-50 plan. Instruction book sent free. Song Bureau, Salem, Indiana.

**ADELMAN** Bros., Music House, Atlas Building, Washington, D. C., are now accepting song poems worthy of publication. Members: National Board of Trade.

**MANUTYPE** Prints music by hand just like orchestrations. Only \$2.00. Arranging instructor free! Manutype Co., Ft. Wayne, Indiana.

**SONGWRITERS**. Interesting information free. Law Gould, Peace Dale, R. I.

**MUSIC** School for sale making \$100 week. Box 466, Spokane, Wash.

**USED**—Rebuilt nationally known instruments—Bargain prices. Supply limited. Write at once for information. Tom Brown Music Company, 315 South Wabash, Chicago.

**SONGWRITERS**: Write for wonderful proposition. Ideal Music Studio, Montville, New Jersey.

**SONGWRITERS!** Astounding offer. Ray Hibbeler, D1, 2157 No. Avers, Chicago.

**POEMS** Set to music. Published. Free examination. Send poems. McNeil, Bachelor of Music, 1582 P.W. 27th St., Los Angeles, California.

**VIOLINS**—Deep, mellow, soulful—on credit. Easy terms for wonderful instruments. Get details today. Send for booklet. Gustaf F. Henning, Fischer Studio, Seattle, Wash.

**SONGS** Published, arranged and composed, royalty basis. W. Coast Music Pub., 942 Market, San Francisco.

**SONGWRITERS**—Get all inside facts. Free booklet by famous Broadway composer. Songwriters Institute, 330C Wadsworth Avenue, New York.

**MUSIC** Composed to words. Wonderful proposition. Rauer Bros., Oshkosh, Wis.

**SONGPOEMS** Wanted. Your song published. National Songland, "PM," Thomaslon, Maine.

**DUO-FLEX** Reeds for clarinets, and saxophones eliminate your reed troubles. Write for circular. Duo-Flex Reeds, 1204 1st Ave., Evansville, Ind.

**NEW** Deal. Write Sequoia Songwriters Service, Sherman Branch, Los Angeles, Calif.

**WANTED**: Original poems, songs. Get our proposition first. MMM Publishers, Studio Bldg., Portland, Ore.

**SONGWRITING**. Good money being made from songs through talking pictures, radio, phonograph, music publishers. "Hit" writers revise, arrange, compose music to your lyrics, lyrics to your music. We submit to studios and other markets. Free reading. Send for booklet. Universal Song Service, 871 Meyer Bldg., Hollywood, Calif.

**HAVE** You seen our new book catalog? It's free. Just send 3c postage. Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

## BUSINESS OPPORTUNITIES

**BIG** Profits operating "route" penny peanut and gum vending machines. Start with \$100.00. Robbins Co., 1141P DeKalb Ave., Brooklyn, N. Y.

**PROFITABLE** Mail order agency information. Start your own business with few dollars, sparetime at home. Steady, daily income. New tested successful plans developed by experts offered every month. Complete details stamp. Money-Making Opportunities Club, 517 East Tenth Ave., Amarillo, Texas.

**MAKE** Fast selling products at home. Formula catalog free. Kemico, 210, Park Ridge, Ill.

**200** NEW And unusual money-making ideas; many from government records. 35c (stamps accepted). Enterprise Bureau, Syracuse, N. Y.

**NEW** Repliable punchboards. Sell wherever demonstrated. Currier Manufacturing, 311 Terminal, Minneapolis, Minn.

**FREE** Books mail order home work. Circular mailing. Dolsen Herald, 75 Gates, Brooklyn, New York. (Stamp.)

**A** NEW Business invites you. Free particulars. Burch-2, White Bluffs, Washington.

**100** SELLING Plans 50c (coin). Getz, 127 Brick, Dickson, Penna.

**BARGAINS**—Paint spray outfit, gasoline engine drive. Terms—trial. Helmick Paint Spray Exchange, M-485, Troy, Ohio.

**START** Own business resilvering mirrors, refinishing metal, plated articles, autographs, tableware. Experience unnecessary. Small investment. Combination outfit. Sprinkle, Plaster, 127A, Marion, Indiana.

**WANTED**. Agents propositions. Books, plans, etc. Becker, 22P Hale Avenue, Brooklyn, N. Y.

**HUGE** Profits! Operate your own home mail order manufacturing business. James Lund, River Falls, Wis.

**START** A business of your own. Manufacture a chemical automobile specialty. Small capital needed. Tremendous earning possibilities. Free details. Bucknam, 177 State Street, Boston, Mass.

**YOU** Want more money? Particulars free. Macrae, 440, Greensburg, Penna.

**"FREE** Instructions"—10 page booklet on making and decorating plaster novelties free. Big demand! Big profits! Write immediately! Stewart's Studio, 2102 West 19th, Chicago.

**LEARN** The collection business. Handle large sums. Write Cole Associates, Syracuse, N. Y.

**MAIL** Business. Start small. Everything furnished. Free details. Metromails, P-4, Cincinnati.

**CIGARETTE** Vending machines, \$15.00-\$30.00. Ferguson, 578 Parkside, Buffalo, N. Y.

**FREE** Literature. Postal brings latest spare time moneymaking opportunities. Becker, 221, Hale Avenue, Brooklyn, N. Y.

**"SALES** Opportunities" magazine. Sample 10c. Six formulas included free. Martex, Princeton, Minn.

**PROFIT** With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, BD-4702 No. Racine, Chicago.

**MONEY** In mushrooms! Grow them now, in cellar or shed. Exclusive new process. Bigger, better, quicker crops. We buy. Book free—write today! American Mushroom Industries, Dept. 605, Toronto, Ont.

**MRS. M. M.** earned \$267 in 3 weeks (sworn statement) raising mushrooms for us in her cellar! Exceptional? Yes, but your cellar, shed, barn may be suitable to bring moderate income all winter. Book, sample free. (Estab. 1908.) United, 3848-A228 Lincoln Ave., Chicago.

**MASTER** Business opportunity. Stability Products Co., 79-20 - 45th, Elmhurst, N. Y.

**WE** Start you in business, furnishing outfits and instructions, operating "Specialty Candy Factory" home. Men and women, earn \$25.00 up to \$75.00 weekly, all or spare time. Booklet free. W. Hilmyer Ragadale, Inc., Drawer, 4, East Orange, N. J.

**SUCCEED** With your products. Formulas, processes, analytical service. Information free. B. Thosly Co., Washington, D. C.

**HOME** Made device does the work of 12 men. Free information. Zuhara, 648 N. Morgan, Chicago.

**START** Printing business. Big commissions! Print anything. No capital needed. We furnish everything. \$100,000.00 plant. Particulars stamp. Ferguson Printing Co., Indianapolis, Indiana.

**MAIL** Order dealers—Take a short cut to more business. Free booklet tells how. Economical Advertising Service, 3028 North Whipple, Chicago.

**UNIVERSAL** Opportunities Publication, six months 25c. D. C. Laboratories, 719 Edgewood, Balto. Md.

**BUY** Wholesale—1,000,000 articles. Directory 25c. Midwest, 4854 Reading, Cincinnati.

**FREE**—New Profitable mail order agency information. Baker, 5509 Winthrop, Chicago.

**DOLLARS** For you—Mail order publishing business, thousands earned yearly. Send 25c for 44 page book—and instructions. Popacme, 2138 Carlisle, Philadelphia.

**OPPORTUNITY** Magazines; big mail; propositions—dime. Midwest, 4854 Reading, Cincinnati.

**HIG** Mails, 319 S. Marengo, Pasadena, Calif. Name inserted 25c. Thousands send samples, opportunities, money getters. We send big package magazines. Book "Help" hints worth \$5.00.

**LIQUID** Silver—Just dip—it plates! Brilliant, durable. Particulars free. Metacraft, Arcade Building, St. Louis, Mo.

**LEARN** Motion picture theatre business. Catalog. Theatre Institute, 335 Washington, Elmira, N. Y.

**SPARE** Time Industries, Omaha, Nebraska. "Journal for Ambitious Folk." Copy 10c.

**24** WAYS To make money 10c. Business Builders, Hanover, Mass.

**WE** Purchase all kinds printed matter. Magazines, newspapers, autographs, letters, etc., worth 50c—\$5.00. Enclose 10c for purchasing catalogue. Book Exchange, 33 Essex, New York City.

**ONE** Man with auto, for county franchise. Make and sell food and other products, to general and grocery stores. Good repeater. Write Budd Laboratories, 20 W. Clifton Ave., Cincinnati, Ohio.

**DIME** Brings many unusual opportunities. Modern, 1001 Nelson Avenue, New York City.

**START** Light manufacturing business assembling stencil duplicators for us. Excellent profits. Dupligrath Company, 616 Tenth St., S. E., Rochester, Minnesota.

**AMBITIOUS?** Paying proposition. Details free. Roembild, 304 E. 125, Cleveland, Ohio.

**HOW** And where to obtain capital fully explained, particulars free. Star Service, Wapakoneta, Ohio.

**\$1.00** MONTHLY Opens New York office with oldest organization. Co-Operative Mail Service, 128 Lexington Avenue.

**12** MONEYMAKING Secrets! Successful sparetime business. Full instructions, 10c. Mail Service, 2231 McKinley, Berkeley, Calif.

**START** Photo finishing business at home. Amazing money-making opportunity. Experience unnecessary. We supply complete outfit, directions for printing-developing pictures. Special starting offer: Outfit including ruby lamp, package printing papers, frame, printing-fixing powders, tray, thermometer, etc.—all only \$1.95 postpaid or \$1.95 C.O.D. plus postage. We tell you where, how to sell. Splendid profits. Order! (Photographic Almanac free.) Central Camera Company, (Established 1890), 230 South Wabash, Dept. 8354, Chicago.

**OPERATE** Chain world's finest money making vending machines. Sell four products—same time. Instant success! Small capital—profits immediately. No curiosity seekers. Penny King, 1233 Chouteau, St. Louis.

**SWAP!** Sell! Anything! Anywhere! 4 months 10c. Traders-Exchange, Brookings, S. Dak.

**START** Profitable business. Small investment. 300% profit. Plan, sample, 25c (coin). Helne, 3534-N. Lawndale, Chicago.

**INCORPORATE** Your business. Liberal Delaware laws. Sell shares. Raise capital. Cost \$38. Free details. Corporation Fiscal Co., Dept. PM, Wilmington, Delaware.

**LEARN** Accurate collecting. Good income, quick results. Interesting booklet free. National Collectors Assn., Newark, Ohio.

**LEARN** Marbleizing: With our snow-white cement. Imitates marble perfectly. Make your own molds, with our rubber composition, 70% rubber. No heat required, no special equipment. Anyone can do. For statues, novelties, etc. (See samples.) Send dime for Martha, or Geo. Washington mold with marbleized beautiful coat. Cowell Institute, Grayling, Michigan.



**1,000 WAYS** To make money in sparetime. Every plan a winner. Literature free. Franklin Publishing Company, 800 North Clark Street, Dept. 2302, Chicago.

**PLASTEX Industries** offers industrious men an opportunity to start a business of their own, manufacturing art goods, novelties, souvenirs, etc., in Plastex and marble imitation. The material makes \$1 articles. Rubber moulds furnished for speed production. Small investment brings big returns. You are just in time for the big 1936 business. Write for interesting booklet mailed free. Plastex Industries, Dept. A, 1085 Washington Ave., New York.

**I MAKE \$200.00 Monthly** from small sideline mail order business. Particulars free. Grinstead, Edwardsville, Illinois.

**LIQUID Marble**—Anyone can make! Colorful, glazed! Moulded, brushed, sprayed. Rubberlastic moulds. Composition flooring. Big money making these! Particulars free. Marbleizing Service, Edwardsville, Illinois.

**FREE Plans, books, circulars.** Make thousands of dollars selling by mail. Home, Spare time. Mail Order Institute, 193-H Tompkins Ave., Brooklyn, N. Y.

**STEADY Cash income** resilvering mirrors; replating fixtures, tableware. Easy factory methods. Experience unnecessary. Make outfits. O'Custer, HP-224 Highland, Detroit, Michigan.

**LATEST Money making ideas.** Eastern Service, 902 Walnut Avenue, Baltimore, Maryland.

**"SCHEMER Magazine,"** Alliance, Ohio, prints schemes, ideas, business starters, formulas—big winners; \$10,000 to \$50,000 reported. 38th year: \$1.00. Trial special: Six months only 50c.

**FREE Plans, books, circulars.** Make thousands of dollars selling by mail. Home, Spare time. Mail Order Institute, 193-G Tompkins Ave., Brooklyn, N. Y.

**POPCORN, Crispette, caramels, potato chip, salt nut machines.** Long Eakins, 1660 High St., Springfield, Ohio.

**FREE Booklet describes 107 plans** for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

**GET Lots of mail.** Money making offers, etc. Your name in 10,000 directories, 25c. Roscoe, 4627 Glenshade, Cincinnati.

**START Little business anywhere.** Everything furnished. No canvassing. Maywood, PM-923 Broadway, New York.

**ARTIFICIAL Marble sanitary flooring.** Instructions covering wood or cement flooring 1/2 inch thick, fireproof, all colors, low cost, ornamental casting, concrete, plaster, papier-mache, garden furniture, statuary, flexible molds, particulars free. Chris. Mahler, Elmont, N. Y.

**I WANT To send you proof** of the wonderful pulling power of Popular Mechanics Magazine's classified pages. What's your proposition? Write me today. P. W. Johnson, Manager, Classified Advertising, 200 E. Ontario St., Chicago, Ill.

**MAIL Order business is your opportunity.** Many began small, now earn thousands yearly. No personal contact. Boundless opportunities. Have had over 30 years experience; will help you succeed. Send 25c for valuable booklets, none free. B. Breniser, 257 South 21st, Philadelphia.

**SELL By mail.** Books, novelties. Bargains! Big profits. Particulars free. B. Elton, 525 S. Dearborn, Chicago.

#### MONEYMAKING OPPORTUNITIES

**MILLIONS Jobless! Make money.** Like we do, supplying them satisfying, job-getting information (got man 76 openings). Keep dollars you receive; we fill your orders free. Stamp brings details. Co-Operative Service, 77 Swan, Buffalo.

**PLUMB Shops on wheels.** Master plumber guides you. Tells all. Not a school. Immediate profits. Small capital. Man or woman. Particulars free. One Trip Plumber, 615 Cherry, Jackson, Miss.

**SELLING Out—Monocymaking books** at less than cost. List for stamp. Merritt Co., Box 51, East Orange, N. J.

**MAKE More money gilding picture frames.** Easy factory method. Personal instruction, materials, formulas, \$7.50. American School of Gilding, Santa Fe, New Mexico.

**EARN Extra money.** Details 10c. Stephen Loeb, 1508 Larrabee, Chicago.

**MAKE \$10 Daily.** Three formulas for 20c. Box 5, Cornishville, Ky.

**ROMANO Pays the world's highest prices** for old coins, paper money, encased stamps. Important! Notice our full page advertisement on page 29A.

**RECOVERY Of used lubricating oil.** Produce high grade motor oil from crankcase drainings. Details and samples, \$1.00. George Woods, 210 - 5th Avenue, Suite 1102, New York City.

**IMPRINT Circular pulling 36% cash orders.** Absolutely new. Nothing for you to buy or sell. Keep money received and send us the names. 25c (coin) brings sample and full details. Imprint Service, Smithboro, N. Y.

**EARN Money at home.** Big profits. Plans 25c coin. Owens Service, Millport, N. Y.

**SPARE Time work.** Large profits. Plan 10c. Save-a-Home Association, Antrim, Penna.

**\$50.00 A WEEK** With car and camera—big profits with your inexpensive camera. Described on page 62 in new Photographic Almanac and Bargain Book of cameras and supplies. Write for free copy. Central Camera Co., 230 So. Wabash, Dept. 5354, Chicago.

**MAILORDER Digest** publishes local and mailorder plans, schemes, formulas, opportunities. \$1. Trial six months 25c. Metro, 126 Cannons, Louisville, Ky.

**RECEIVE Big mails, magazines, samples.** Your name in 5,000 directories, 10c, including directory. National, Box 335-WS, Saginaw, Michigan.

**BUSINESS By mail.** All profit. No scheme. Postal brings details. Hampton, Beechwood, Rochester, N. Y.

**FIVE Profit-plans.** Complete, authentic. \$1 bill. Kayrob, Canisteo, N. Y.

**MAKE Useful articles** from tinkers found in ordinary ashes. Real moneymaking opportunity. Complete instructions 50c. Adolph Ringl, 12524 Moran Ave., Detroit, Michigan.

**NEW \$3 Letter printer!** Fourfold profits using, demonstrating. Mailmarts, PMF-2, Cincinnati.

**SCHEMER—Giant dime getter—Sample plan and instruction 25c coin.** Fast motion. Box 175, Station C, Montreal, Canada.

**"PRIVATE Brands" magazine.** Money with your own products. Formulas, methods, each issue. Sample free. Myers Publications, Troy 2, N. Y.

**EARN Extra money, addressing, mailing circulars.** Details. Stamp appreciated. Bada Service, P. O. Box 74, Brooklyn, N. Y.

**FREE Booklet describes 107 plans** for making \$20-\$100 weekly, in home or office, business of your own. Elite Co., 214 Grand St., New York.

**TO Win success you must do something different; particulars free.** Publishers Sales Company, Box A-67, Nelson, Georgia.

**BIG Money at home** plating auto parts, reflectors, mirrors, chandeliers; by new method; experience unnecessary. Outfits furnished. Gunmetal Co., Ave. N, Decatur, Ill.

#### FORMULAS, PLANS, ETC.

**MAKE Your own brushless shaving cream.** All materials and directions to make two quarts of the finest cream for only \$1.00. Almont Chemical Co., 1622 Larchmont, Lakewood, Ohio.

**FORMULAS.** All kinds. Guaranteed. Catalog "Special Offer Free." Kemico, 32, Park Ridge, Ill.

**2,000 FORMULAS.** Facts, processes, trade secrets in Dr. Brown's Book of Formulas—380 pages. Price, postpaid \$1.00. Ogilvie Publishing Co., 57 Rose Street, Dept. 25, New York.

**EXTRAORDINARY—Wealth using formulas.** Large catalogue free. Brown's Formula, 212 East Waters, Tampa, Florida.

**500 MONEYMAKING Formulas 25c.** Descriptive literature free. Harvey Teeple, Decatur, Indiana.

**AMAZING Paint and varnish remover.** No scraping. Just rub. Inexpensive, non-injurious. Formula 25c. Becker 22F Hale Avenue, Brooklyn, N. Y.

**FORMULAS—List free.** Anden Laboratories, 225 - 7th St., Rockford, Ill.

**A FREE Sample copy of Income Increaser Magazine** given with each order for 500 money making formulas and trade secrets. Bucknam, 177 State Street, Boston, Mass.

**SAMPLE Formula and list, dime and stamp.** Kayrob, Canisteo, N. Y.

**NEWEST Guaranteed formulas.** Biggest catalog free. Special prices, leads. Gibson, Chemist, RD-4702 No. Racine, Chicago.

**ANY Formula 50c, three \$1.00.** Cole Laboratories, Bryant Pond, Maine.

**2,342 FORMULAS** For making adhesives, wood killers, ant destroyers, enamels, face powders, vanishing creams, lotions, rust removers, waterproofing compounds, gold plating, floor waxes, soaps, polishes, etc. Explains how to mix ingredients, clarify liquids, grind materials, where to buy supplies. Start a business of your own. This 300-page book, \$2.00. Franklin Publishing Company, 800 North Clark Street, Dept. 2401, Chicago.

**TRISODIUM Phosphate—White powder.** Wonderful formula solvent, quickly dissolves dirt, grease, paint. 25c gets sample, supply sources, useful formulas. Waldo, Box 260, Dallas, Texas.

**SUCCEED With your products.** Formulas, processes, analytical service. Information free. B. Thaxly Co., Washington, D. C.

**FOR Any complete, guaranteed formula,** send \$1.00. McGillicuddy Laboratories, Box 1093, Seattle.

**CHEMICAL Analysis.** Practical formulas. Consultation. Write. Associated Chemists, Indianapolis, Indiana.

**PROVEN, Tested, successful formulas.** Blitter, 1713 Powers Street, Cincinnati, Ohio.

**FORMULAS—Guaranteed paint and varnish remover, \$1.00.** Baic, 1150 Leonard Ave., St. Louis, Mo.

**TESTED Formulas—Largest, most complete line.** Catalog free. Grinstead Laboratory, Edwardsville, Illinois.

**FORMULAS—Latest money makers.** Literature free. Belfort, 4042 N. Keeler, Chicago.

**FORMULAS—Tried, tested, proven.** Best money makers! Average cost only 4c per formula! Write for interesting information. Best-Formulas-of-the-Month Club, Mayo, Florida.

#### CHEMISTRY

**NEW Big catalog!** Chemical sets, microscope outfits, laboratory apparatus, biological supplies, chemicals. Approved by experimental laboratories. Send 10c now (refundable) and get special 30 day offer. Witam, 124W West 23rd St., New York.

**HANDBOOK** For chemical experimenters, for students and amateur chemists, revised, illustrated, 50c. Chemical catalogue—5c. Booklist free. Reading Scientific Company, Reading, Pa.

**SPECTROSCOPE** And book of 120 experiments, \$2.50. Kutting Sons, Campbell, Calif.

**25 CHEMICALS** With experiments, 50c. Kayare Chemicals, 5522P Ft. Hamilton Parkway, Brooklyn, N. Y.

**LEARN Chemistry—Complete course, \$15.** Easy payments! Details free. College, 4831-N Hamlin, Chicago.

**ECONOMICAL Chemistry supplies.** Catalogue 5c. Damon Chemical Company, D176, Alliance, Ohio.

**FREE Chemistry catalogs.** Supplies at 5c! Equip complete laboratory. Send 3c postage. Kemkit Corporation, 135P Johnson Street, Brooklyn, New York.

**CHEMICAL Analysis and industrial problems.** Estimates free. Essco Laboratories, 2206 Lyacote, Detroit, Michigan.

**CHEMICALS, Laboratory glassware and apparatus.** Catalog CP. Biological Supply Co., 1176 Mt. Hope Ave., Rochester, N. Y.

#### HELP WANTED

**FASTEST Selling style-sensation** in years! Beautiful "Scottie" handbag, endorsed and praised by Sally Eilers, famous screen star. Genuine plaskin. California trim. Chrome initial. 3 roomy compartments. Exclusive patented side-opening gusset—"Talon" zipper locked. Free key-case. Low wholesale price. Free sample offer. "Scottie" Bag, 605 Washington, Dept. B-206, Chicago.

**BIG Advance cash profits** selling men's quality hats, made-to-measure, rain-proof caps. Bargain prices. Your own hats, caps free of extra charge. Outfit free. Taylor Hats, Dept. B-22, Cincinnati, Ohio.

**GO Into wholesale business** without investment. Call on stores with biggest line self-selling counter displays: Aspirin, razor blades, handkerchiefs, breathlets, household cement, 79 different items. Up to 125% profit for you. Experience unnecessary. Write for catalog and plans. Procopax, Dept. 36-XD, 1956 S. Troy, Chicago.

**USE \$500?** Halse canaries for us. Guaranteed market. Free particulars. Crimmins, 3741-G 60th, Woodside, New York.



MRS. M. M. earned \$538 in her cellar (sworn statement) raising patented giant mushrooms for United (estab. 1908). Exceptional? Yes, but your cellar, shed, barn may be suitable to bring moderate income all winter. Book, sample free. United, 3848-A229 Lincoln Avenue, Chicago.

SAVE 30% To 50% on groceries and household necessities besides making up to \$32.50 a week. Automobiles given to producers. Details free. Albert Mills, 2762 Monmouth, Cincinnati, Ohio.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 12A.

MONEY In mushrooms! Grow them now. In cellar or shed. Exclusive new process. Bigger, better, quicker crops. We buy. Book free—write today! American Mushroom Industries, Dept. 606, Toronto, Ont.

#### AGENTS WANTED

AMAZING Money maker! Ladies' genuine Steerhide leather handbag. Half regular price. Big commissions. Lifetime quality. New, exclusive, features. Two zipper compartments. 22 karat gold engraved name and initials. Free coin purse, mirror, key case. Gift sensation. Sells on sight. Free sample offer. Halvorsen, 605 Washington, Dept. K-6, Chicago.

FULL Letter-size stencil duplicator; only \$3.00! Prints letterheads, menus, advertising etc., black or several colors. Complete with ink, stencil, etc. Big demand offices, stores, churches, schools, restaurants, etc. Big profits. Write quick for free samples work and details. Rocket Duplicator, Dept. Z-571, Cincinnati.

WHOLESALE Catalog free. 500 best sellers. Paly Co., 1107 Broadway, Somerville, Mass.

MAKE 212% Profit! Metalix—amazing new "metallic liquid" instantly, permanently repairs metal, wood, glass, leather, etc., without heat, acid or tools. Holds forever! Free sample. Write, Metalix, Dept. Z-313, Cincinnati.

MEXICAN Feather pictures. Unusual novelty. No competition. 25c (stamps) brings \$1.00 worth sample and details. Refunded if unsatisfied. Mexican Art, Apartado 1503, Mexico City.

AGENTS Coining money everywhere. Free samples. "Window Lettering." 2410 Maple, Los Angeles, Calif.

100% PROFIT In the "Self Starting Cigarette Lighter." No flint or friction. What makes it light? No wind can blow it out. Retail 35c. Costs \$2.00 per dozen. Sample and sales plan 25c. New Method Company, Desk PM-40, New Method Bldg., Bradford, Pa.

DOUBLE-EYED Self-threading needle packages, also 3/8. Blind people thread them, invaluable for failing sight, necessary for good sight. Five samples 25c. Twenty packages, dollar bill, 100 packages \$5.00. Particulars. Wm. Oglesby, Vandalla, Ill.

AGENTS—Sell our Luminous Crucifix (it shines in the dark) for handsome profits. Hannan Co., 2620 South Parkway, Chicago.

\$2.00 HOURLY With new, scientific cream that mends all cloth easily, quickly, invisibly, without needle and thread. Stands laundering. Free sample. Sewnmore, Z-744, Cincinnati, O.

AGENTS—Make \$72.00 from \$9.00 investment. Every home, store, factory a prospect. Write today. Quick Bandages, 801 N. Sangamon, Chicago.

CASH Income daily silvering mirrors at home. Plating auto parts, tableware, etc. Combination outfit. Write Sprinkle, Plater, 128, Marion, Indiana.

HAWAIIAN Novelties: Good profit for sincere workers. Send fifty cents coin for dollar samples, information. Box 2273A, Honolulu, Hawaii.

COIN Money selling colored people. Give away free pictures of Joe Louis with hair preparation. Valmor, 2241-NM Indiana Ave., Chicago.

HANDS Up! But don't worry! "Mystery" trouser belt with secret pocket defies thieves, conceals and protects money. No betraying zipper. Looks like any fine, lined leather belt. Men eager to own it. Startling demonstration sells it. Costly genuine Birgoid buckle included. Remarkable profits. Free sample offer. "Mystery" Belt, 605 W. Washington, Dept. P-90, Chicago.

FREE! Descriptions, 450 newest money making opportunities. Metromalls, P-4, Cincinnati.

450% PROFIT In new automatic gas lighter. No flint or flame. Lights gas instantly. Retail 25c. Costs you \$1.00 a dozen or 15 dozen for \$8.00 postpaid. Sample 10c. New Method Co., Box PMQ-40, Bradford, Pa.

\$6.85 HOURLY! Amazing No-Flatz fixes punctures without patching; makes tires puncture proof! Instantly—permanently seals holes made by nails, etc. Big seller. Free sample offer. No-Flatz, Dept. Z-172, Cincinnati, Ohio.

MAKE 100% Profit. Write for particulars. Malling Bureau, Lawndale, Calif.

SELL Stores, factory fresh gum. Big profits. Sample outfit 50c. American Chewing, Mount Pleasant and Fourth, Newark, N. J.

REPLATE Brass, copper, etc., with my silverplator. 4 oz. 50c. Agents wanted. Dixon, 912 W. 48, Kansas City, Mo.

\$6.00 HOURLY. Amazing Karna refinishes auto like new without rubbing, polishing, waxing or painting. Wipes on with cloth. Lasts 8 to 12 months. Free sample. Karna, Dept. Z-8, Cincinnati, Ohio.

EVERYBODY Needs food! I'll give you a wonderful chance to make \$9.50 a day supplying nationally known products on weekly route. Complete outfit sent on trial without money risk. Albert Mills, 2762 Monmouth, Cincinnati, Ohio.

MAKE And sell your own products. Employ agents yourself. We supply formulas and full instructions for making toilet preparations, perfume, flavoring extracts, soap, household specialties. Valuable booklet free. National Scientific Laboratories, 1050W Broad, Richmond, Va.

CASH Paid for butterflies, insects. See Sinclair Display Advertisement on page 12A.

PROFIT With new products. Make, sell, repeat. Guaranteed formulas, special prices, leads. Biggest catalog free. Gibson, Chemist, RD-4702 No. Racine, Chicago.

EXCLUSIVE Distributor: Trial order \$1.00. Your profit \$2.00. Money back if misrepresented. Bur-Lite Special, Hudson, Ohio.

SELL Men's ties, razor blades, etc., big money for you. Heli Premium Co., M-5, Gaylord, Minn.

AGENTS—Good profit item, outfit \$1.00. Haney, Box PM598, Cincinnati.

MAKE Big money with our sterling silver initialed photo rings. Send for proposition. Gibson Photo Jewelry, 837 McDonald Ave., Brooklyn, N. Y.

SELL Made to measure raincoats. Outfit free. Goodyear Rainwear, 126 West 22nd, New York.

SUCCEED With your products. Formulas, processes, analytical service. Information free. B. Thasly Co., Washington, D. C.

500% PROFIT! Gold and colored sign letters for windows, offices, trucks, signs. Monograms. Easily applied. Neonite, Akron, Ohio.

FREE Sample new photo novelties, 300% profit. Novel-Ad Company, 3327 North Ave., Chicago.

SEND Hose size for samples and chance to earn \$20 weekly. Show sensational guaranteed hose. Guaranteed against holes or replaced free. Dignified, pleasant work. Wilkitt Hosiery, Desk 37-D, Greenfield, Ohio.

NEW Type genuine bristle bath mitt. Highly efficient, economical. Every person is prospect. Substantial profits. Ker-lee Company, Arlington Heights, Illinois.

\$3.00 HOURLY! Amazing automobile ornament. Produces revolving colored light. Propell-O-Lite Company, Mt. Washington, Ohio.

SALESMEN, Crew managers, agents. Big profits. Write for catalogue. Dandy Mfg. Co., 6 Bleeker Street, New York, N. Y.

DISTRIBUTORS—Sell table model radios. Trutone Radio Co., 1700 South Ogden, Los Angeles.

PERMANENT Income selling auto seat covers, sun glasses. Write, Rice 135-15 227th, Laurelton, N. Y.

STOP Squealing—Start crowing!! Drive out to country or "movies"—afternoons, work mornings—home! Unusual "plan"! National Folio, (Metro-stal), Los Angeles.

AGENTS—Crew managers—Wagon men. New 25c item—write at once. Sells to everyone. World Specialties, Inc., A-900 West VanBuren, Chicago.

MEN Or women. Big profits. Quick sales. Repeat orders. Saves customers money. No opposition. Make \$5 and up daily. Master Supply Co., Randolph, Vt.

BIG Money in tire patches. Sell New auto tire patch to service stations, garages, etc. Tiger-Grip patches guaranteed 10,000 miles. \$75 weekly for salesmen or distributors. Protected territory. Write Economy Rubber Co., 794 Burkhardt, Darton, Ohio.

EARN Up to \$100 weekly underselling stores. Fast selling necessities. We furnish stock. Write today for catalog-agency offer. National Products, 116, Berwyn, Ill.

BRONZE Signs, nameplates, memorial tablets, letters, bulletin boards, railings, metal specialties. Always a ready market. Easily sold. Big profits. Write for full particulars and new catalog. Newman, 671 West Fourth Street, Cincinnati, Ohio.

Sell Perfumed starch direct to consumer. New delightful household product. Rapid seller. Big repeater. Fine profits. No investment. Send quick for free sample and liberal terms. Hoyt Bros., 104 Shipman St., Newark, N. J.

MAGIC Gas increases mileage 25-30%. Used by bus companies. Harmless, guaranteed. Approved by automotive engineers. Amazing sales records. Free radio advertising. Agent's name on cans. Particulars, proof free. P-46 Magic Gas Building, Alexandria, Ont., Canada.

MAKE Good money taking orders; shirts, ties, underwear, dresses, hosiery, raincoats, pants, uniforms. Sales kit free! Nimrod Company, Department 8, 4923-28 Lincoln Avenue, Chicago.

WANTED—Direct purchasing agents. No experience or money required. Write Purchasing Manager, 174 N. Halsted, Chicago.

BIGGEST And quickest sales are made in brushes. Write for proposition. Wire-Grip Sanitary Brush Corporation, 220 Southern Boulevard, New York.

AUTO Radio—World's cheapest. Entirely new. Write J-20th Century Co., Kansas City, Mo.

AGENTS: Smash go prices! Santos coffee 12c lb., 4 oz. vanilla 8 1/2c, razor blades 10 for 8 1/2c, 100 sticks chewing gum 12c, 100 other bargains. Experience unnecessary. Write Carnation Co., P.O. St. Louis, Mo.

AGENTS Mosco corn and callous remover will build you a steady repeat business. Send today for pocket-size trial outfit. The Mosco Company, 64 Scenic Bldg., Rochester, N. Y.

GOLD Reflecting letters for store windows. Easily applied. Large sizes, penny each, free samples! Atlas Sign Works, 7941 Halsted, Chicago.

100 PROFITABLE Mail order and local business plans. A. Pruitt, Elburn, Ill.

AGENTS—Opportunity to make money; book containing 107 successful business plans; home or office; send for free introductory booklet. Elite Co., 214 Grand St., New York.

PROFITABLE Home business. Legitimate. No canvassing. Maywood Publishers, P-923 Broadway, New York.

GENUINE Gold letters for store windows. Easily applied. Free samples. Liberal offer to general agents. Metallic Letter Co., 438-B North Clark, Chicago.

AGENTS: Stamping names on pocket-key protectors. Sample check with your name, address. 25c. Stamping outfits. Emblem checks, check-fobs, name plates. Hart Mfg. Co., 303 Decatur St., Brooklyn, N. Y.

BIG Money and fast sales. Every owner buys gold initials for his auto. You charge \$1.50; make \$1.45. Ten orders daily easy. Write for particulars and free sample. American Monogram Company, Dept. 40, East Orange, N. J.

MAN In each town to plate auto parts, reflectors, bathroom fixtures, refinish beds, mirrors, chandeliers; by new method. No capital or experience required. Simple plan of manufacturing at home starts you in big money-making business. Outfit furnished. Free particulars and proofs. Gun Metal Co., Ave. B, Decatur, Ill.

NEW Cleaner! Washes clothes quickly. Cleans everything. Premium deals. Free sample. Bestco, 5007 Irving Park, Chicago.

BIG Money applying gold initials on automobiles. Easiest thing today. No experience needed. Free samples. "Balco," 1084 Washington, Boston, Mass.

SELL Townsend postcards, big demand, large dollar assortment starts you. Charlton Associates, Chicago, Ill.

JUST Published—New 1930 edition Popular Mechanics Book Catalog. "A Million Ideas." Thousands of books on practical subjects. 3c stamp to cover postage brings you this valuable catalog. Popular Mechanics Press, 200 E. Ontario St., Chicago.



## HIGH-GRADE SALESMEN

**MEN!** Here's good paying work with a large shoe company. Good pay every day. No experience needed. Complete sales outfit sent free. Write Consolidated Shoe System, Dept. K13, Chippewa Falls, Wisconsin.

**ATTENTION Salesmen!** If you want to step into a dignified, sure money-making plan that's sweeping the country, line up quick with our sensational business stimulator deal for every retail store. No premiums. Positive money-back guarantee to increase sales 10% to 20% for grocery, drug, cigar stores, meat markets, beauty parlors, service stations, etc. Sells on sight. Represents like sixty. Up to \$15.00 cash in your pocket daily. Experience unnecessary. Start making fast money immediately. Just send your name and address—post card will do—for complete free outfit. Federal Trade Builders, K-176 Adams, Chicago.

**EARN** Big pay every day in advance. Sell complete line printed business necessities, advertising bank matches, gummed labels, advertising novelties, sensational business stimulators and complete line process engraved-like combinations for professional trade. New low prices. New plan. Experience unnecessary. Large 1936 outfit free! Northwestern, SX-625 Jackson, Chicago.

**GIVE** Away free 1936 short wave and home radios, also full electric automobile radios with our unique "Punch Sales Card Plan." 2 sales daily pays \$203.83 weekly profits. Write for our free starting offer. DeLuxe Mfg. Co., Dept. 253, 173 W. Madison, Chicago.

**SALESMEN—**Something new; sells on sight; unlimited prospects; sales repeat; exclusive territory; liberal commission. Chemical Specialties Co., Milwaukee.

**MEN** Wanted by world wide industry. Write today for particulars about few good old Raleigh routes that have paid well for years. Established, profitable business. Over 200 farm and home necessities. Industry and reliability main qualifications. Man with auto preferred. Give age, experience, references. Raleigh's, Dept. D-N-PPM, Freeport, Ill.

**CAN** You fill a business position? Information mailed promptly. Country or state rights. Executive and sales ability necessary. Excellent opportunity. 150% profit. Art Service, Bremer Arcade B, St. Paul, Minn.

**TODAY'S** Fastest selling item. No competition. Sells on sight. Only individual toothbrush sterilizer manufactured. Exclusive territory for live wire salespeople. Send \$1.00 for \$1.50 samples and details. 100% profit. Steral Sales Company, Lorain, Ohio.

**NEW** Presto wind proof clear lighter packed six chromium on 1000 hole punch board. Sells to dealer at \$8.00. It's a knock-out. You collect \$2.00 as your commission. We ship C.O.D. \$6.00. Get particulars. New Method Co., Box PMP-40, Bradford, Pa.

**BE** Independent. Own your business; experience unnecessary, selling \$10.000 accidental death, \$50 accident; \$25 sick weekly benefits—\$10.00 yearly. Other amounts proportionate. Guaranteed steady renewal income. \$726,415.63 securities deposited. Universal Policy, 716-A Lafayette Bldg., Newark, New Jersey.

**MAKE** Big money steady. High grade coveralls, shopcoats, pants, shirts, raincoats. Advertising on back. Fast sellers. Free outfit. Strong Mfg. Co., 2320 W. 22nd St., Dept. N-11, Chicago.

**BIG** Money makers: Large line work uniforms, raincoats, pants, shirts, etc. Advertising embroidered. Low prices. Every business, individual prospect. Free outfit. Dore Garment Co., 1733 Milwaukee Ave., Dept. 115, Chicago.

**STRANGE** Ironing cord. Saves electricity. Abolishes scorching and kinking. For telephones also. 150% profit. Sales guaranteed. Big free offer. Novetnost, Dept. 4-A, 4503 Ravenswood, Chicago.

**SELL** Process raised letter printing \$3.95 thousand. Free cut service. Worth \$6.00. Commission \$1.00 advanced. Experience unnecessary. United, F-8 South Dearborn, Chicago.

**MANUFACTURER** Wants local man—Represent line fine shirts with new Tru-benzed starchless collars. Ties, underwear, hose also. Exceptional values. Maker to wearer. Large earnings daily; cash bonuses regularly. No investment. Expensive outfit free. Write Dept. PM4, Quaker, Broadway at 31st, New York.

**SALESMEN—**Here's your chance to contract exclusive selling rights the "Charm" wrench, your state. General Wrench Company, 231 Kearny, San Francisco.

**MAN—**Sideline, full time, handle regular store route 10c counter card merchandise. 100% profit! Fast responder! No competition! Nationally, locally advertised. Details free or sent 25c for \$2.80 value. NoDor Awakeners, PM-4, Sacramento, California.

**AMERICA'S** Fastest selling garment line. Pants \$1.39 to \$4.95. Raincoats \$2.95 to \$4.95. Broadcloth and polo shirts. Uniforms with free lettering. Smashing low prices, biggest commissions, cash bonuses, free garments to producers. Write now for free selling outfit. Dunlap Pants Co., Dept. C-1, Cincinnati, Ohio.

**MAN—**Handle regular store route. Place nationally advertised 5c-10c counter card merchandise. New aspirin deal—6 tablets 5c, 85 other fast sellers. 100% profit. No investment. Samples free. World's Products Co., Dept. 4810, Spencer, Ind.

**CALIFORNIA'S** Sensation—New true fruit product; one 15c package makes five glasses home type jelly in five minutes without use of fruit juices. Should make \$10.000 first year. Minute Foods, Ltd., 257 Werdin Place, Los Angeles, Calif., Dept. 608.

**CORRESPONDENCE** School salesman—Experienced, energetic man can earn good income. Leads furnished. Liberal commission. Several territories available. Must have car. Write, giving experience and references. E. S. Smith, Federal Schools, Inc., Minneapolis, Minn.

**SELL** Retailers; world's best dime value. Southern Products, Enid, Okla.

**SALESMEN:** Sell complete line book matches, labels, carbonized sales books, pricing sets, business stationery. Wonderful sideline. Free deals. Comm. daily. Free sales portfolio. Lionel, Dept. JA, 312 So. Hamilton, Chicago.

**SELL** "Do-All" Combination Electric Hammer and Drill to contractors, industries, installers. Wodack Corp., 4627 Huron St., Chicago.

**MAKE** More money taking orders; shirts, ties, underwear, dresses, hosiery, raincoats, pants, uniforms. Sales hit free! Nimrod Company, Department 65, 4022-28 Lincoln Avenue, Chicago.

**SOMETHING** New in fire extinguishers—Red Comet Automatics. Proved in west fire years. Exclusive territory. Low price opens pocketbooks. Write, Red Comet, 404 Comet Building, Littleton, Colorado.

**DO** You want a good selling item, needed in almost all homes? Either as a principal or a side line. Write Tift, Tift Road, Route 1, Dover, N. H.

**MAKE** Big money—Commissions advanced, sell Popular Mechanics work shoes—complete line of dress shoes—outfit free. Dura-Tex Shoe Co., 80, Brockton, Mass.

**SALESMEN:** Sell advertising novelties, calendars, fans, thermometers, etc., for nationally known firm. Liberal commissions. Stanwood Hillson Corp., 21 Station St., Brookline, Mass.

**NEW** Specialty—Sells every business and professional man. Four \$15 sales daily may \$280 weekly. Fayer cleared \$1020 in three months. Write, F. E. Armstrong, President, Dept. PM, Mobile, Ala.

**SALESMEN—**New deal guarantees stores \$10 for one. Two \$15 sales net you \$20 daily. Sayers, 2801-123 Sheffield, Chicago.

**FREE** Booklet describes 107 plans for making \$20-\$100 weekly. In home or office, business of your own. Ellis Co., 214 Grand St., New York.

**BRAND** New grab-bag deal. Going big everywhere—big profits—swift sales—fast repeats. No restrictions. All dealers buy. Act! K&S, 4373 Ravenswood, Chicago.

**START** A business of your own! Become a subscription representative for "Popular Mechanics." No capital required. Liberal commissions. Monthly bonus. Write for details. V. D. Angerman, Circulation Manager, 200 East Ontario Street, Room 235, Chicago.

## SURVEYING INSTRUMENTS

**GUARANTEED** Factory rebuilt transit and levels for rent (with purchase option) or sale (cash or terms). Order now before prices advance. We will repair, trade in, or buy your old instruments. Ship prepaid for estimate and valuation. Write for List M-14 and complete information to Warren-Knight Co., 130 N. 12th St., Philadelphia, Pa.

## EDUCATIONAL AND INSTRUCTION

**WINDOW** Trimming. Crepepaper displays, professional instructions. Quickly learned at home. Splendid opportunities! Advance Displays, 1563 Madison, Chicago.

**ELECTRIC** Refrigeration—Air conditioning. Rapid growth creates big demand for trained men. Earn up to \$35.00—\$50.00 weekly. Get facts. Write for free book. Address President, U. E. Inst., 404 N. Wells, Box 146-A, Chicago, Ill.

**LEARN** Auto mechanics, body, fender, welding, electricity, refrigeration, Diesel. Stevenson's, 2084A Main, Kansas City, Mo.

**WORK** For "Uncle Sam." Start \$105-\$175 monthly. Men-women, age 18-30. Common education. Are you eligible? Get our free questionnaire—find out. No obligations whatever. Write, Osmont Instruction Service, 101, St. Louis, Mo., quickly.

**LEARN** Machinist trade, tool, die making. Automatic and hand screw machines. Modern shop methods. Actual work. Jobs open for trained men. Employment help. Illustrated booklet free. Allied Screw Machine Company, 601 Lake Street, Chicago.

**STOP** Wasting talent! Learn to write short stories—novels—movie plays—radio plays—complete instruction course \$1 postpaid. Particulars free. Author Craft, 3129-N Linder, Chicago.

**STAMMERING** Corrected quickly at home. Write—Colwell, 815-M Wellington, Chicago.

**BECOME** A chartered master bookkeeper, business executive, or accountancy expert, by examination, credit evaluation, or home study. Tuition \$3.00 monthly. Write Institute of Business Structural Engineers, Box 1055, Sacramento, Calif.

**DRAFTING.** Machine drawing. Home study courses. Educational Institute, Box 933, Lubbock, Texas.

**SECRET** Service. Particulars free. Write immediately. George Wagner, M-2040 Broadway, New York.

**\$105-\$175 MONTH.** Work for "Uncle Sam." Men-women. Try next announced examinations. List jobs and particulars free. Write today sure. Franklin Institute, Dept. 413, Rochester, N. Y.

**WANTED:** Men with average intelligence to learn scientific crime detection and secret service. My fifteen years in United States secret service should be your guarantee that I'll train you successfully. Information free. Write Joseph Kavanagh, International Secret Service Institute, PM-46, Hoboken, N. J.

**SHORTEST** Methods solving arithmetical problems. Frederick A. Smith, 2410 Smalley Court, Chicago.

**BIG** Bargain catalogue educational matter 10c. Handling, Y-709 Broadway, New York.

**MEN** Wanted willing to learn landscape designing and fill big paying positions as landscape architects. Free test of your natural ability and chance to win in \$750 contest. No experience needed to start. Earn while you learn. Write today for free test blank. American Landscape School, 400 Plymouth Bldg., Des Moines, Iowa.

**HOME** Study courses leading to degrees: Arts and sciences, philosophy, education, law, letters, theology, psychology, engineering, chemistry, business and commerce. Many others. McKinley-Roosevelt University, Chicago.

**CHIROPODY** Taught by correspondence. Evans School of Chiropractic, Montgomery, Alabama.

**U. S. GOVERNMENT** Positions. \$1700-\$1900 and up a year. Let our expert (former government examiner) prepare you for a position in the railway mail service, rural carrier, post office, customs and other branches. Write today for free booklet. Dept. 8, Patterson School, Rochester, N. Y.

## CARTOONING—COMMERCIAL ART

**AMATEUR** Cartoonists—Win \$25.00. No drawing ability necessary to win. 26 prizes in all. Rush name on postcard for valuable tips on "How to Make Money With Simple Cartoons"—Cash prize entry blank and rules. Send no money. Cartoonists' Exchange, Dept. C-94, Pleasant Hill, Ohio.

**ARTIST** Will design your ideas. Cartoons, advertisements, illustrations, music covers, posters, letterheads. Lowest rates. Needle. 220 North 3rd, Maywood, Illinois.

**IF** You like to draw, sketch or paint—Write for free talent test and art book. Give age and occupation. Federal Schools, Inc., Dept. P46, Minneapolis, Minn.

**SELL** Your cartoons. "Cartoonists' Guide" tells where! 25c. Hoffman, 3235-M Jefferson, Cincinnati.



**ARTISTIC** Silhouette pictures. Framed \$1.00. Art Studio, 1329 Vanburen, Missoula, Mont.

**CHALK Talks.** Laugh producing program, \$1.00. Catalog free. Balda, The Cartoonist, Oshkosh, Wis.

**ARTISTS Specials.** Six assorted artists pens 25c. Complete cartooning course, 700 illustrations 50c. Latest list of cartoon buyers 25c. Lawrence Publications, 173-A West 97th St., New York.

**CARTOONISTS**—Sell your sketches. Directory and selling details, 25c. Graphic Service, 417 Southway, Baltimore, Maryland.

**CARTOONING Course**—30 lessons, over 500 illustrations with drawing pens, paper and pencils. \$1.00 complete. Seorell Studios, Box 710-P, Hollywood, Calif.

**CARTOONISTS:** New amazing plans bring good income. Investigate now. Jenkins, 448-P Wrigley Bldg., Chicago.

**MAKE \$25.00 Weekly** copying funny cartoons. Amazing details free. Write—Paisley, Kinloch Bldg., St. Louis, Mo.

**CARTOONING, Sketching, etc.**—48 lessons, 600 illustrations, including practice sheets, pens, pencils. \$1.00 complete. Fraba Service, Cashion, Wisconsin.

**PENCILGRAPHING** Makes sketching easy as writing. New, simplified method. Entirely self-instructing. Over 100 illustrations in beautiful cloth-bound book show just how it's done. Start classes, make your hobby profitable. Complete with all working materials \$3.48 postpaid. Pencilgraphing, Inc., Wenatchee, Wash.

#### ADVERTISING AGENCIES

**ADVERTISE Profitably:** \$15 reaches 6,000,000 Sunday newspaper readers with 24 word ad. Newspaper, magazine rate-guide, free. Chicago Union Agency, 20 West Jackson, Chicago.

**LEARN** Advertising quickly at home. Easy practical plan. No text books. Common school education sufficient. Interesting booklet and requirements free. Page-Davis School of Advertising, 3601 Michigan Avenue, Dept. 343-B, Chicago.

**FREE—New Advertisers Rate Guide,** 44 pages. Includes everything. Lowest rates. E. H. Brown Advertising Agency, 140 S. Dearborn, Chicago.

**ADVERTISING** Placed anywhere. Helpful, free service. Rate guide book free. Baker Advertising Agency, 180 W. Madison, Chicago.

#### BUSINESS SERVICE

**DELAWARE** Charters; fees small; free forms. Chas. G. Gayer, Inc., 901 Market St., Wilmington, Del.

**INCREASE** Your business! Have permanent New York address. Business, personal. Mail forwarded daily. \$2.00 monthly. Associated Service, 1457 Broadway, New York.

**ALL** International legal matters. Lic. Victor Prieto, Mexican Attorney at Law, P. O. Box 122 M. Juarez, Mexico.

#### COLLECTION SERVICE

**"BAD Debts"** collected everywhere. No collection, no charge. American Adjustment Association, Department P. M. 7, South Dearborn, Chicago.

#### RUBBER STAMPS AND OFFICE SUPPLIES

**NAME, Address, 2 lines** 25c; 3 lines 35c. Stamp Works, Auburn, Nehr.

**2 LINES** 25c, 3 Lines 35c. Rubber Stamp Works, Centerport, N. Y.

**CUSHION** Mounted, one—two lines. 25c. Three 35c. Stamp Works, 814 Bradley, Peoria, Ill.

#### TYPEWRITERS, DUPLICATORS, OFFICE DEVICES

**MULTIPRINTER** \$1.00 Postpaid. Letter size duplicator with supplies. Multiprinter Company, 5710 Woodlawn, Chicago.

**POCKET** Calculating machine. Adds, subtracts. Instructions \$1.00. Mitchell's, 10407 Lexington, Kansas City, Mo.

**DUPLICATORS**—Stencils, inks, office supplies. Catalog. Wholesalers, 4834 Reading, Cincinnati.

**NEW \$4.75** Automatic adding machine. Fully guaranteed. Bassett, 1458A Hollywood Avenue, Chicago.

**TYPEWRITERS, Duplicators, multi-**graphs. Write for free list office machine bargains. Save half. Pruitt, 518 Pruitt Bldg., Chicago.

**INCREASE** Business. "Excelligraph" rotary stencil, clay and film duplicators \$3.85 to \$37.50. Prints anything. Typewritten, penned, drawn, traced. Colors. Folder free. Pittsburgh Typewriter Supply, Suite 518, Pittsburgh, Pa.

#### PRINTING, MULTIGRAPHING, MIMEOGRAPHING, GUMMED LABELS

**1000 BUSINESS** Cards printed on white vellum card \$1.00 cash with order. Whitmar Press, 15 Quincy Avenue, Pawtucket, Rhode Island.

**1,000 BUSINESS** Cards \$1.00 prepaid. T. R. Dickey, Hawthorne, Calif.

**PRINTED** Personal stationery—100 letterheads, 100 envelopes \$1.00. Halberstadt Printing, Terre Haute, Indiana.

**500 STANDARD** Size bond letterheads, envelopes, etc., \$1.75. Illustrations. Bradshaw, 3214-P Huron, Chicago.

**PRINT** Your own. Bargains, presses, type. List 3c. Exchange D-14, 22 Orient, Meriden, Conn.

**250 BOND** Envelopes printed \$1.00 prepaid. Fawks Print, Graceland, Texas.

**BUSINESS** Cards 75c thousand postpaid. All prices low. Magic Press, 5214A Walnut, Philadelphia.

**MIMEOGRAPHING.** Lowest prices. Artistic work. Letters, circulars, booklets. Printing. ACA Service, 7731 Patterson Ave., Chicago.

**250 LETTERHEADS** Or envelopes, \$1.00. Webpress, Farmland, Indiana.

**LETTERHEADS, Envelopes, business** cards, 500, \$1.00. Gardfield Print, 4653 E. 94, Cleveland, O.

**ENCLOSE** This ad. for attractive prices, samples, superior printing. Ledbetter, Johnsonville, Tennessee.

**GUMMED** Labels: 1,000 printed, 1c1%, 20 words or less, 50c. JBS Company, Box 93, Holyoke, Mass.

**1000 STYLE** Bond envelopes; letterheads, \$1.85. Samples, quantity prices. 3c. Southern Publishers, Box 1626Y, Savannah, Ga.

**100 NAME**—Address cards, mimeographed case—40c. Cash, stamps. Hughes Press, 1907 Hughes Avenue, New York.

**1000 ENVELOPES** Or letterheads \$2.00. Samples. Lawndale Press, Franklin, N. H.

**LETTERHEADS, Envelopes, statements, blotters, shipping tags:** 200—\$1.00. Business cards, parcel post labels; 500—\$1.00. Dollar Printers, 1112-L, Ottawa, Illinois.

**5000 ENVELOPES, Letterheads, post-**cards, 6x9 circulars—\$8.99. 1000 envelope slips, \$1.75, 5000, \$3.90—postpaid. Samples. Goodprint, Harrisonburg, Va.

**BETTER** Labels, inner cost! Samples. Labelers, 6618C Quinby, Cleveland, Ohio.

**DO** Your own printing. Save money. Complete outfits \$6.50 up. Write for free details. Kelsey Co., H-24, Meriden, Conn.

**MIMEOGRAPHING** \$1.00—100; \$5.00—1000. Bucla, Box 292, Albany, N. Y.

**100 NAME** Cards 25c. Samples free. Card Co., Neshanic, N. J.

**ENVELOPES, Letterheads, 500, \$1.75.** Watermarked bond. Est. 1898. Autopress, Cashion, Wisconsin.

**1,000 LABELS, 1x2, 3 lines, 60c** money order. Extra lines 10c each. J. Skeba Print, 260 Lawrence, Rome, New York.

**50 BUSINESS** Cards, 25c, postpaid. Ferguson's, 322 North Senate, Indianapolis.

**BETTER** Grade printing, reasonable prices. Free samples. Economic Press, Leonia, N. J.

**1000 BUSINESS CARDS, card case, \$1.50.** Miller, Printer, Ambler, Pa.

#### PRINTING OUTFITS AND SUPPLIES

**HAND** Press, type and complete printers' supplies. Advise equipment you need and we quote prices; or send stamp for catalog. P. Peiffer, 71-A; 6 Columbia St., Newark, N. J.

**PRINT** Your own cards, stationery, circulars, advertising, etc. Save money. Easy rules furnished. Print for others, big profits. Junior press, \$5.00; job presses, \$11, power \$149. Write for details. Kelsey Co., Y-11, Meriden, Conn.

**PRINTING** Presses, type, inks, supplies. Lists 3c. Landis, Richland, Pa.

**WHOLESALE** Paper price list; 3c stamp. VanDorn Company, Ottawa, Illinois.

**BARGAINS**—Presses, type, supplies. Send stamp. 159 Harvard, Cambridge, Mass.

**ENGRAVINGS, Cuts, self-made** cheaply. Instructions, only \$1. Supplies. Fowler, (909), 1457 Broadway, New York.

**BARGAINS, Presses, type. List 3c.** Exchange D-15, 22 Orient, Meriden, Conn.

**PRINT** Your own circulars, envelopes, with home made press costing less than \$1.00. Illustrated instructions 10c. Carl Edquist, Oshkosh, Minn.

**PRINTING** Outfits—Presses, type supplies, type novelties. Send stamp for catalog. Model Press, York, Penna.

#### PATENT ATTORNEYS

**INVENTORS:** Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting inventions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 800-D Victor Building, Washington, D. C.

**PATENTS**—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. Clarence A. O'Brien and Hyman Berman, (Registered Patent Attorneys before U. S. Patent Office), 58-C Adams Building, Washington, D. C.

**WHAT** To Invent. List of wanted inventions sent free on request. Use our legal form for recording evidence of ownership. Write W. T. Greene, 946 Barrister Bldg., Washington, D. C.

**PATENTS** Procured in all countries. United States patent attorney fee \$50; Canada \$20. Reliable preliminary patent search \$5. Mechanical and electrical engineers. Patent sales service on commission basis for meritorious inventions only. International Patent Co., 175 Fifth Avenue, New York City.

**PATENTS, Low rates.** Samuel Goldstein, 275 E. 64th St., New York City.

**PATENTS**—Trade marks—Personal service, reasonable charges. Preliminary advice, book and disclosure form free. Irving L. McCathran, 700B International Bldg., Washington, D. C. Registered Patent Attorney.

**"INVENTOR'S Guide"** containing 100 mechanical movements and advice about patenting, selling inventions, also "Record of Invention" form, free. Frank Luedemann, Patent Attorney-Engineer, Suite 2024, 154 Nassau Street, New York.

**PATENTS.** Protect your idea by securing free "Proof of Invention" folder. Exceptional personal service. Established 1906. E. E. Vrooman, 871 Woodward Building, Washington, D. C.

**PRACTICAL** Inventions now saleable before patenting. What have you? Write Chartered Institute of American Inventors, Dept. 43, Washington, D. C.

**PATENTS.** Booklet free. Highest references. Best results. Promptness assured. Watson E. Coleman, Patent Lawyer, 724 Ninth St., Washington, D. C.

**L. F. RANDOLPH, 302-B** Victor Building, Washington, D. C. Low cost. Book and information free.

**PATENTS.** Instructions "How to Establish Your Rights" and form. "Evidence of Conception"—sent free! Lancaster, Allwine & Roussel, 411 Bowen Building, Washington, D. C.

**INVENTORS**—Send for free booklet "Patent Service." Information based on 84 years experience. Lacey & Lacey, Dept. 5A, 635 F St., Washington, D. C.



## FOR INVENTORS

**PATENTS**—Before too heavy an outlay of time or money is made on an invention, a search of the Patent Office records should be made to determine as nearly as possible whether or not the same idea has been patented before. The cost of this search is small, while the value of the facts it uncovers is often considerable. We offer inventors and manufacturers a thorough prompt, confidential search service—plus experienced counsel and assistance in every phase of Patent and Trade-Mark practice. Write for our new free book containing valuable information relating to patent procedure. (Clarence A. O'Brien and Hyman Berman, Registered Patent Attorneys before U. S. Patent Office, 58-C Adams Building, Washington, D. C.)

**INVENTORS:** Send immediately for your copies of our new free books, "Patent Protection" and "Suggestions on Selling an Invention." Sixty-eight pages of interesting facts. They tell how patent laws protect you; kind of sketch or model needed; simple steps to take without cost; how successful inventors have secured financial assistance; show interesting intentions; illustrate important mechanical movements. With books we also send free Evidence of Invention form to help establish date of disclosure. Prompt service, reasonable fees, special deferred payment plan. Strictest secrecy. Thirty-six years' experience. Highest references. Write us today. The facts in our books are worth money to the man with a good invention. Address: Victor J. Evans & Co., Registered Patent Attorneys, 801-D Victor Building, Washington, D. C.

**INVENTORS**—Ideas developed into practical inventions. Working models built. Low prices. Confidential service. Geo-Paul Engineering Co., 722 N. Gay St., Baltimore, Maryland.

**PATENT Drawings \$5.00.** Specifications written. Ormond Munger, Washington, D. C. Bethesda Branch.

**INVENTIONS** Developed, models made, patents obtained through registered patent attorneys; \$60 for simple patent application; terms. Inventions financed, manufactured! Patents sold 10% commission. Permanent patent exhibition. \$2 monthly per model. Designs, drawings, general machine, experimental work. New Jersey Invention Developing Corp., 50 Church Street, Suite 1077, New York City.

**TO Inventors:** We are in the market to purchase a good patent, preferably a small item made of metal. Will purchase outright or royalty. Purchasing Agent, 241 Front St., New York, N. Y.

**ESTABLISH** Priority date use "Protecto-seal," three 25c. Dohner 2834-C North 54, Milwaukee.

**WRITE.** Obtain, sell your patent. "Inventors' Handbook" tells how. \$1.00. Institute Publications, 4215 - 17 Avenue, Brooklyn, New York.

**INVENTIONS** Patented by former patent office examiner. Samuel Goldstein. See "Patent Attorneys."

**UNPATENTED** Ideas can be sold. We tell you how and help you make the sale. Particulars, with list of manufacturers and wanted inventions sent free on request. Write W. T. Greene, 944 Barrister Building, Washington, D. C.

**HAVE** You a sound, practical invention for sale, patented or unpatented? If so, write Chartered Institute of American Inventors, Dept. 4A, Washington, D. C.

**SELL.** Your patent through a small classified ad in Popular Mechanics. Many inventors have found buyers in this way. Ask me for proof—I'll gladly send it to you. P. W. Johnson, Manager, Classified Advertising, 200 E. Ontario St., Chicago.

**INVENTORS:** "Making Inventions Pay," our 32-page illustrated book, mailed upon receipt of 2c postage. Crescent Tool Company, Dept. Z, Cincinnati, Ohio.

**PATENTS.** Low cost. Book and information free. L. F. Randolph, 302-C Victor Building, Washington, D. C.

**INVENTOR'S** Universal Educator: contains 900 mechanical movements; 50 perpetual motions; instruction on procuring and selling patents and selecting an attorney, etc. Suggests new ideas. Price \$1.00 postpaid in U.S.A. Address Albert E. Dietrich, 511-B Colorado Bldg., Washington, D. C.

**I SELL** Patents. Established in 1909. Charles A. Scott, 773PM Garson Ave, Rochester, N. Y.

## INVENTIONS WANTED

**GRILLE** Or register for forced air. Patented or unpatented. Will buy outright or manufacture on royalty basis. Address Purchasing Agent, 2119 Washington, Kansas City, Mo.

**WILL** Pay cash for your invention if practical. Write today. Darby, 124 Church, Buffalo, N. Y.

**FREE** Book—Protecting—Selling Ideas. Quickly. Inexpensively. Inventor, 1901-18 Street, Altoona, Penna.

**WE** Successfully sell inventions, patented and unpatented. Write for proof, and tell us what you have for sale. Chartered Institute of American Inventors, Dept. 4-C, Washington, D. C.

**SMALL** Inventions wanted by manufacturers. I'll help you sell your invention. Stanley Hall, 7829 Euclid Avenue, Cleveland, Ohio.

**INVENTIONS** Wanted—Patented, unpatented. If you have an idea for sale, write Hartley's, Inc., Box 928-E, Bangor, Maine.

## PATENTS FOR SALE

**FOR** Sale—Patent December 17, 1935, No. 2,024,294. Detachable handle for coffee pot and percolator. Andrew Kirsch, Carroll, Iowa.

**PATENT** For sale on new sash holder made of steel wire. Could be sold by millions. Cost one cent to manufacture. Investigate this. Neil Monaster, McKenzie Island, Ontario, Canada.

**FOR** Sale: Outright or royalty, an unique simulating-hunting toy. Patented U. S. For particulars write to Harold Jacobin, 15103 Box 316, Fort Madison, Iowa.

**ROYALTY:** U. S. patent 2,009,338, 1935. Outright: Canadian patent duplicate of same. Tire clamp used in pairs to service drop center rims. Size 6.50". Adjustable to smaller sizes; usable with wheel on or off of car; neat, strong, improved. Cheap to manufacture, stampings. Orville C. Brown, Cuba, Ohio.

**POCKET** Dispenser for tablet, candy ring. A. Pearson, 5012 Tioga Street, Duluth, Minnesota.

**OUTRIGHT** Or royalty: New "Fountain comb." For beauty parlor and home use. P. Fotza, 1121 N. Wood St., Chicago, Ill.

**ELECTRIC** Appliance. Baresch, 1108 131 St., College Point, New York.

**MANUFACTURERS** Looking for new inventions should write W. T. Greene, 939 Barrister Bldg., Washington, D. C.

## MANUFACTURING

**DIES.** Stampings, light manufacturing, development engineering. Hagstrom Model & Tool Works, Kansas City Mo.

**MANUFACTURING** Models, dies, stampings, brasswork, casting moulds, vulcanizing moulds. Catalog 3c. Baums Metal Spetsy., Kansas City, Mo.

**INVENTIONS** Manufactured in any quantity at low cost. Stampings, dies, models, etc. Estimates and free catalog. Crescent Tool Co., Dept. X, Cincinnati, Ohio.

## MODELS AND MODEL SUPPLIES

**ALUMAWELD** Successfully solders aluminum, die cast metals and cast iron. For information address—Alumaweld, 2444 So. Parkway, Chicago, Illinois.

**MARINE** Type steam engines. Excellent for ship models. Illustrated circular for stamp. Detroit Model Engines, 4409 Trumbull, Detroit, Mich.

**MODEL** Steam locomotive  $\frac{3}{4}$ " scale. Easily made. Particulars, casting list, photo, 25c. Little Engines, Box B15, Wilmington, California.

**POWER** Models, steam, gasoline, electric, accessories for ships, railways. 80 page catalog 25c. Chas. Cole, Ventura, Calif.

**GASOLINE** Model supplies. Kits. List free. Newark Model Airplane Co., 51 Jacob, Newark, N. J.

**MODEL** Makers lathe. Particulars for disc. Deper Model Shop, Muncie, Indiana.

**MODEL** Air cooled two cycle gasoline motor. Circular 5c. Anton Bohaboy, Rahway, New Jersey.

**CATALOG** 17A, 15c listing blue prints, engines, tools and supplies. Howards, 2417 N. Ashland, Chicago.

**EVRAV'S** Catalog No. 36—Engines, models, castings, wood and metal working machinery. Catalog No. 37 modelmakers and experimenters materials and supplies. Either postpaid 20c or both 40c. Canada 30c each. Coin or stamps. Advance bulletin for stamp. Evray Mechanics Supply Co., PM-28 N. Clinton, Chicago.

**YACHT** Model fittings, for Zip, Vanja and others. Send for illustrated list. A. J. Fisher, 1002-1 Etowah Ave., Royal Oak, Mich.

**SHIP** Models—Build 18" Flying Cloud, Constitution or Galleon. All materials including full-sized plans only \$1.50 from Hancock, 323 Douglas Ave., Portsmouth, Virginia.

**MODELS**—Your ideas developed into practical working models. 30 years' successful experience; thousands of satisfied customers. Confidential service guaranteed. Bank references. Send 3c postage for 32-page book—"Making Inventions Pay." Crescent Tool Company, Dept. Y, Cincinnati, Ohio.

**BRASS** Gears and model supplies. Send for catalog. The Pierce Model Works, Tioley Park, Ill.

## PLANS, BLUEPRINTS, INSTRUCTIONS

**16** LAWN Ornament blueprints, up to 21" high, 35c each. Modern Woodcraft, 1343 Wadsworth St., Saginaw, Michigan.

## HOME CRAFTSMEN

**METAL** Spinning—Complete homeshop information. \$1.00. Lorraine Sales, 2152 West 61, Cleveland, Ohio.

**LAWN** Chair. Pattern cut on cardboard. 55c postpaid. J. Creamer, 79 Merrill Ave., Lowell, Mass.

**LEATHER** For all purposes. Leathercrafts, 126 West 90th Street, New York.

**"MODERN** Wood sculpture." Complete instruction book on carving statues \$1.00. Leo Wood Art Studio, Centerville, Ia.

**TROPICAL** Woods of Cuba. The most beautiful woods. Send 10 cents (coin) for descriptive literature and prices. Dr. Wm. F. Ordetz, P. O. Box 1283, Habana, Cuba.

**LEATHERCRAFTSMEN**—Write for free instructions and price list of leather, tools and beginners' kits. Send 5c for sample cards. Address Wilder & Company, Dept. P, 1038 Crosby St., Chicago, Ill.

## WATCHES, JEWELRY, PRECIOUS STONES

**AUSTRALIAN** Opals, all varieties, good assortment \$5.00. Lists free. Norman Seward, Melbourne, Australia.

**SAVE** One half on guaranteed watch repairing. Crystals 15c. Price list free. Paul Jewelry Co., LaCrosse, Wis.

**LEARN** Watchmaking. Lessons, practice, movement \$1.00. Catalog 5c. Stewarts, Sixth & Olive, St. Louis, Mo.

## OLD GOLD WANTED

**CASH** For old gold teeth, crowns, bridge-work, jewelry, watches. We are smelters and refiners and pay you high prices, because we refine into dental gold. Satisfaction guaranteed or shipment returned. Free information—Dr. Weisberg's Gold Refining Company, 1593 Hennepin, Minneapolis, Minn.

**CASH** For gold, teeth, jewelry, watches. High prices paid day shipment received. Satisfaction absolutely guaranteed or articles cheerfully returned. Chicago Bankers or Chicago Association of Commerce are your references for honest dealings. Information free. Chicago Gold Smelting & Refining Co., 300-P Champaign Bldg., Chicago.

## FOR THE HOME

**CLOCKS:** Build your own grandfather's, banjo, shelf. Thousands built successfully. Some with beautiful chimes. Directions 10c. Particulars free. Clock Company, 1673 Ruffner, Philadelphia.

**YOUR** Family coat-of-arms 11x14" oil painted \$12.50. Descriptive color sketch  $5\frac{1}{2}$ x7", \$1.00. Selden, Heraldic Artist, 1500 Laburnum Ave., Richmond, Va.

**BUILD** A summer cottage. Ideal for mountains, seashore. Comfortable, inexpensive. Can be used all year. Choice of 6 designs. Sketches free. Masonite, 111 W. Washington, Chicago.



## TOBACCO

**GUARANTEED** Tennessee's very finest, "Golden Heart" mild, mellow redleaf chewing or smoking. 5 lbs. \$1.00 postpaid. Ernest Jolley, Dresden, Tenn.

**LOOK!** Mellow, milder, golden yellow smoking or rich ripe chewing, five pounds, \$1.00. Riverview Plantation, 211, Cottage-grove, Tenn.

**FREE** Cigars, pipe and cigarette roller with Goldleaf guaranteed chewing, smoking or cigarette tobacco, 5 lbs. \$1.00, ten \$1.75. Co-Operative Dealers, Sedalia, Ky.

## RAZOR BLADES—SHARPENING

**SHARPEN** Razor blades the new way. Request information. Nu-Sharp Products, P. O. Box 24, Fremont, Ohio.

**DREXEL** Blades—double 1½c, single 1¼c. Guaranteed. Banderman, Higginsville, Mo.

**100 BLADES**—Finest grade, genuine Mayfair double edge, blue steel. Postpaid for \$1.00 bill or M.O. Matthews Sales, Midland, Pa.

**RAZOR** Blades sharpened keen, 1c each. Peiter Wetterquist, Rockford, Ill.

**25 DOUBLE** Edge blades—25c. (Postpaid.) Boyd Service, Lima, Ohio.

## TATTOOING

**AMATEUR** Tattooing outfits, free folder. Chicago Tattoo, 651A South State, Chicago.

**TATTOOING** Outfits, supplies. Illustrated list, "Waters," 965 Putnam, Detroit.

## FOR SALE OR EXCHANGE

**1,000 SWAPS** in Trader's Bulletin. Sample copy, 10c. 190 N. Wells, Chicago.

## WANTED—MISCELLANEOUS

**WANTED:** Scrap silver, pewter, tinfol, aluminum, copper, brass. Send samples advising quantity. Zimmermann, 3214 Berteau Ave., Chicago.

**MIDGET** Racing cars—Build one yourself. New book tells all about them. 50 pages \$1.00. Popular Mechanics Press, 200 E. Ontario St., Chicago.

**CASH** For used microscopes, binoculars, slide rules, drawing sets, surveying, scientific instruments, marine equipment; complete libraries and standard sets. Send detailed list. Highest prices paid day shipment received. Satisfaction guaranteed or shipment cheerfully returned. Kisan's 2302 VanBuren, Chicago.

**HIGH** Prices paid for old books, newspapers, pictures, envelopes. Buden-Kaye Enterprises, Plymouth, Pennsylvania.

## PERSONAL

**STUTTERING** And stammering easily and effectively corrected at home. Booklet free. Paul J. Wolfe, Box 52, Pittsburgh, Pa.

**FREE**, Important literature on the attaining and maintaining of natural health. Dr. P. L. Haynes, 308 Bigelow Bldg., Seattle, Wash.

**FOOT** Sufferers: Stop hating tired, aching feet. \$1.00 brings you my proven method. P. O. Box 264, Monroe, La.

**ROMANO** Pays the world's highest prices for old coins, paper money, encased stamps. Important! Notice our full page advertisement on page 29A.

## MISCELLANEOUS

**CIGNAPRINT!** Prints names, advertisements on cigarettes, cards, anything! Sample, dime. Mailmarts, PMG-3, Chisholm.

**ALASKA**—Learn best places; population doubling some sections. Send \$1 for maps, analyses, opportunities. One area never sold as Washington, D. C., has coal for taking, beach gold, moose, fishing, trapping, farmlands. Alaskafacts, Box 1292, Juneau, Alaska.

**FORTY** Minerals, \$1.00. List and sample. 10c. Oliver Atkin, Tariffville, Conn.

**CASH** Income daily silvering mirrors at home. Plating auto parts, tableware, etc. Combination outfit. Write Sprinkle, Plater, 288, Marion, Indiana.

**DELUXE** Treasure finder plans, \$1.00. Free offer. Cloughart, Grayling, Michigan.

**GOLD** And silver locator, \$5.00 postpaid, 30 days free trial. Write Henry Bergman, Box 398P, Springfield, Missouri.

**PRACTICAL**—Profitable books. Catalog 3c postage. Popular Mechanics Magazine, 200 E. Ontario St., Chicago.

**CASH** Paid for butterflies, insects. See Sinclair Display Advertisement on page 12A.

**SCIENTIFIC** Astrology. One dollar. Better this year. Stars tell how. Birth, hour, day, month, year. Rose M. Thompson, Box No. 168, Harrisburg, Ill.

**LET** Fortune and good luck surround you eternally through this oriental mascot, consisting of miniature heads of 7 Japanese gods of prosperity and happiness artistically arranged on a big natural shell. Suitable as surprise gift. Price \$1. Post free. P. O. check or inquiries to Seicho Trading Co., Tairamachi, Meguroku, Tokyo, Japan.

**GET** In big money earning class; operate radiator repair shop, easy work. Complete directions \$3. Perry Laboratories, Elizabeth City, N. C.

**MAKE** Your own blue prints. Instructions including sample tracing and prints. Postpaid \$1.00. Drawing outfits as low as \$3.50 post paid. Rapid Blue Print Service, Cedar Rapids, Iowa.

**ROMANO** Pays the world's highest prices for old coins, paper money, encased stamps. Important! Notice our full page advertisement on page 29A.

**ELECTRIC** Or gasoline portable lamp kills insects automatically. Indoor or outside. \$1.75 up. Literature free. Sauer Bros., East Oakland, California.

**FIND** Gold, professional miner, prospector, fortune hunter's methods, equipment. Ten piece kit \$2.50. Guaranteed. Mineral Research Laboratories, 403A Montgomery, San Francisco.

**BABY** Calculator—Adds or subtracts with ease. \$1.00 postpaid. Marker Billingsley, Nashville, Tenn.

**CUTS** Anybody can make. Zinc etching process. Specimens, particulars, testimonials for stamps. J. C. Day, Windfall, Ind.

**CALIFORNIA** Sea shells—forty different named \$1.00 catalogue. Tom Burch, 433 99th, Inglewood, California.

**HOW** To Win Prize Contests, price 50c postpaid, 100 prize winning slogans given free with each book. James, 742 San Julian, Los Angeles, Calif.

**BRONZE** Tablets, desk plates, wall plates, memorials, grave markers. Bronze, brass and aluminum casting. Wandkey Pattern & Foundry Co., Anderson, Ind.

**MONUMENTS** \$0 up delivered, erected, guaranteed. Thousands sold. Catalog free. Marble Granite Factory, A-17, Oneco, Fla.

**POCKET** Mucilage pencil—fastens anything. Stops runs in hosiery. Just moisten. No spilling, no waste. Sanitary container. 10c, 3 for 25c. Glidden, 78-P Elder, Schenectady, N. Y.

**BRONZE** Grave markers. Beautiful, lasting memorials. \$6.50 up. Discounts to agents. Inland Monument Co., 247 W. Chestnut St., Walla Walla, Wash.

**AMATEUR** Cartoonists can earn \$35.00 weekly, spare time, duplicating cartoon advertisements. 3-M Syndicate, Argyle, Wis.

**WHOLESALE** Supply sources, half million items, 10c. International Agency, Cincinnati.

**TREASURE** Seekers—Make your own gold finders. Wras, 104½ Frances, St. Joseph, Missouri.

**SWAPPER'S** Friend. B4, Salline, Michigan. Interests swappers, collectors, sportsmen. 50c year, sample 10c.

**A STEADY CASH BUSINESS!**  
Operate a "chain" of 1c peanut and chewing gum vending machines. Large, steady profits, as people eat peanuts and chew gum daily. Start with \$100. Write for details today!  
**D. ROBBINS & CO.**  
1141P DeKalb Ave. BROOKLYN, N. Y.

**OLD STAMPS WANTED**  
**WE PAY UP TO \$1000.00 EACH**  
Old stamps (as late as 1927) now gathering dust in your attic, trunk or basement may be worth a fortune to you. Thousands wanted. Send for booklet telling what to look for, and the prices we pay.  
**Also CASH PAID FOR OLD LETTERS WITH STAMPS ON.**  
**ARCADE STAMP & COIN CO.**  
36 Euclid Arcade, Cleveland, O.

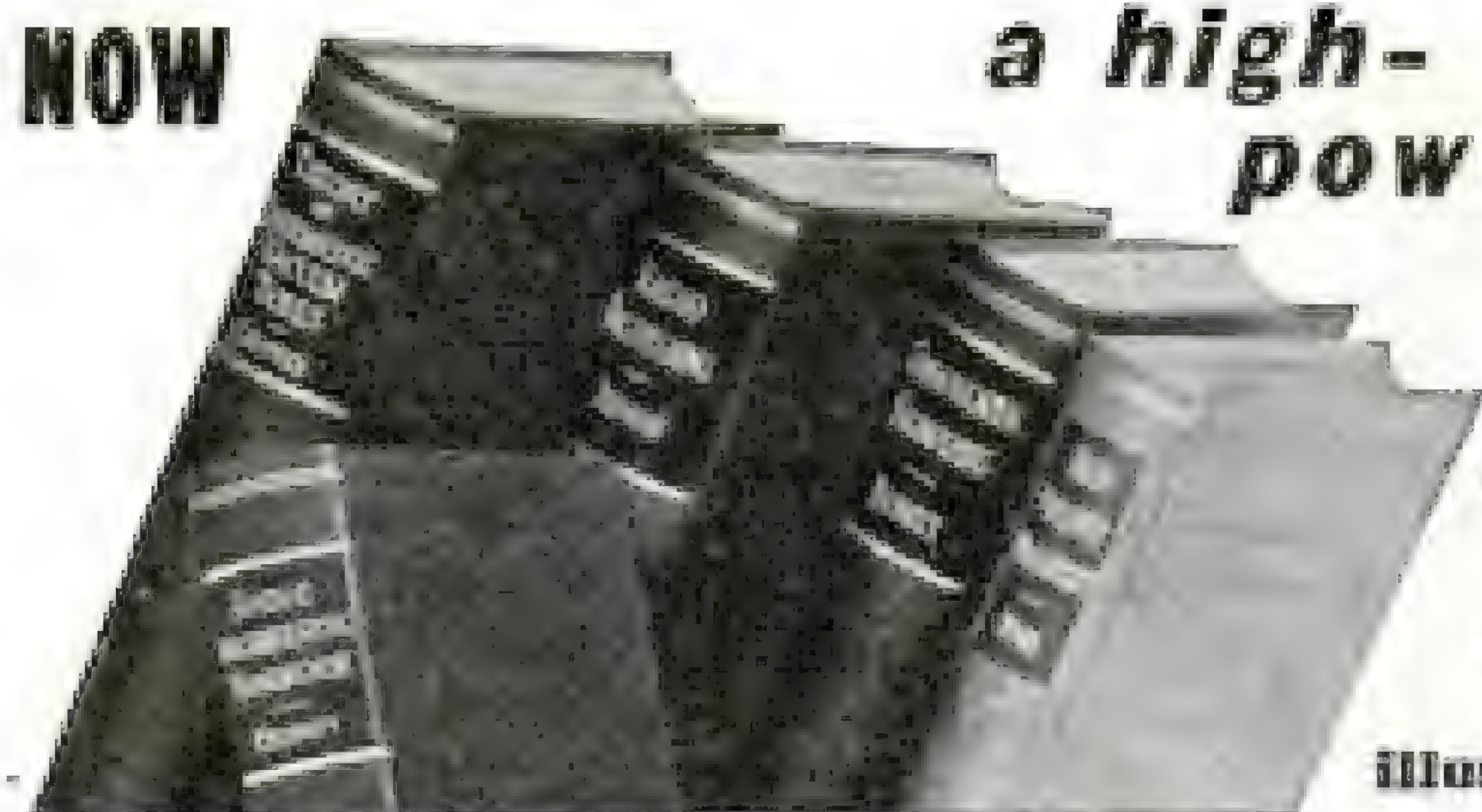
**AMAZING CAN JAR & BOTTLE OPENER**  
**WORKS BY NEW MAGIC METHOD**  
Millions of women waiting for it. Three devices all in one. Opens Cans, Jars, Bottles of any size, shape or style in a jiffy. Takes off entire top of can. Leaves velvet smooth edges. No cut, bruised fingers. Removes tightest jar tops instantly. Fits on walls; always ready, handy. Money-back guarantee.  
**Leaves Smooth Edges**  
**AGENTS! BIG PAY EVERY WEEK**  
Startling demonstration makes instant sales. Amazingly low priced. Two Magic Selling Plans pour money into your pocket. Trial sample offer.  
**MAGIC PRODUCTS COMPANY**  
4234 Cozens Ave., Dept. CD-370, St. Louis, Mo.

**Free LESSONS ON THE MUSICAL SAW**  
Write today for simple, easy to learn lessons. No musical knowledge or experience necessary. Popular money-making entertainment. Our detailed drawing "Golden Tone" Musical Saw, Acoustic Model, Toys, Magic Tricks, etc., will be sent with the FREE LESSON.  
**AMATEUR ACTS SUPPLY CO.**  
"Everything for Fun"  
604 3904, INDIANAPOLIS, IND.

**ELECTRICITY!**  
**RADIO • REFRIGERATION • DIESEL ELECTRIC POWER**  
**Learn Quickly in Spare Time at Home - by Practical Shop Methods**  
New easy way to prepare for jobs leading to salaries of \$30, \$40, \$50 a week. Opportunities to earn \$5-\$10 a week and more while training. Learn by doing actual jobs in your own home electrical shop. Electrical Equipment and Apparatus supplied at no extra cost to make training practical. No previous experience or advanced education necessary. Money back if not satisfied. Write for FREE BOOK of Facts and Opportunities for you as a trained Electrical Man.  
**ELECTRIC INSTITUTE**  
5940 Addison Street, Dept. 66D  
**H. W. PETERSEN, President**  
Chicago, Illinois  
NAME \_\_\_\_\_ AGE \_\_\_\_\_  
STREET \_\_\_\_\_  
CITY \_\_\_\_\_ STATE \_\_\_\_\_



NOW

a high-  
powered

5  
volumes,  
2981  
pages  
2000  
illustrations

## Radio Engineering Library

—especially selected by radio specialists of McGraw-Hill publications

—to give most complete, dependable coverage of facts needed by all whose fields are grounded on radio fundamentals

—available at a special price and terms.

These books cover circuit phenomena, tube theory networks, measurements, and other subjects—give specialized treatment of all fields of practical design and application. They are books of recognized position in the literature—books you will refer to and be referred to often. If you are practical designer, researcher or engineer in any field based on radio, you want these books for the help they give in hundreds of problems throughout the whole field of radio engineering. 10 days' examination. Special price. Monthly payments. \$26.00 worth of books cost you only \$23.50 under this offer. Add these standard works to your library now; pay small monthly installments, while you use the books.

### SEND THIS ON-APPROVAL COUPON

McGraw-Hill Book Co., 330 W. 42nd St., New York

Send me Radio Engineering Library, 5 vols., for 10 days' examination on approval. In 10 days I will send \$2.50, plus few cents postage, and \$3.00 monthly till \$23.50 is paid, or return books postpaid. (We pay postage on orders accompanied by remittance of first installment.)

Name.....

Address.....

City and State.....

Position.....

Company..... PM-4-26

## STEP INTO THE Spotlight



## Banish Boredom... Earn Extra Money START TO PLAY VERY FIRST DAY

Picture the joy of playing a snappy foxtrot, dreamy waltz or mellow old favorite on the Xylorimba. No reason why you shouldn't! Xylorimba is easiest of instruments to play and yet the most spectacular. In constant demand by orchestras, radio stations, at lodge meetings and parties. Marvelous opportunity to increase popularity, make big spare-time money. No bothersome practice or exercises. With Free easy lessons you actually Start to Play Very First Day.

BIG FREE BOOK tells all about Deagan line, liberal trial offer and easy payments. Send coupon today for your free copy.

J. C. Deagan, Inc., Dept. 9454, 1770 Berteau Ave., Chicago

Send me, without obligation, full details of Free Trial offer and easy-payment plan on the Deagan Xylorimba.

Name.....

Address.....

**Behind the Scenes of CRIME!**  
**WITH FORMER G-MEN**  
Authentic Information  
Compiled and Edited by former U. S. "G-Men"

**INVESTIGATOR'S HANDBOOK**

Here Are the Inside Facts—Useful and Instructive to Everyone

Here are the "inside facts" on G-MAN methods—of special interest to detectives, policemen, lawyers and all others who want to help stamp out crime. For FREE copy write to—  
**INVESTIGATOR'S INSTITUTE**  
National Press Bldg.  
Dept. 604 Washington, D. C.

## NEW!! MIDGET POCKET RADIO



**\$2.99** Complete Postpaid

Fits in any small pocket easily. Weighs only 4 ozs. as shown. Comes in four beautiful colors (Black, Blue, Brown, Silver). NO tubes, batteries, or electrical connections needed! Nothing to wear or need replacement—will last for years—only one moving part! Separates and receives broadcast stations with beautiful clear tone.

Range up to 50 miles—MUCH GREATER under good conditions—very little static or interference! Can be used by ANYONE ANYWHERE! NO CRYSTALS TO ADJUST!! Absolutely complete with midget phone and instructions to use while in bed, hotel, at home, auto, office, camp, on bicycles or any place you may be. No complicated or messy hookups—takes only a second to connect! THOUSANDS OF SATISFIED OWNERS. THESE ARE FACTS. Send only \$1.00 and pay postage \$1.99 plus postage on arrival or send \$2.99 (Cash, Money Order, Check). Ideal Gift. Guaranteed. State Color. ORDER NOW! (Foreign orders 65c extra.)

**TINYTONE RADIO CO., Dept. P-4, KEARNEY, NEBRASKA**

**New York Electrical School** Established 1902  
Ask for free booklet  
44 West 17th St., N. Y. C.

## CIVIL SERVICE

VALUABLE INFORMATION FREE  
COLUMBIAN CORRESPONDENCE COLLEGE  
WASHINGTON, D. C.

## LEARN AVIATION MECHANICS

Secure thorough training in airplane and engine mechanics. Complete flight training—modern equipment.

**ROBERTSON AVIATION SCHOOL**  
St. Louis Municipal Airport - ROBERTSON, MO.

at Low Cost!

## NEON

Prepare yourself quickly for today's biggest opportunity—NEON or "gaseous tube" lighting—most widely used medium of lighted displays, the future's greatest source of illumination. Splendid future. Start now while it is still new!

FREE Booklet describes practical low-cost home-study course. Write! COMMERCIALITE LABORATORIES, Dept. 47-P, OMAHA, NEBR.

**NEW YORK SCHOOL OF MECHANICAL DENTISTRY**

★ Make more money as a DENTIST. We show you how! Oldest school. Real Laboratory Training. Day, Eve. Easy terms. Tools FREE. Ask for Catalog P. N. Y. SCHOOL of MECHANICAL DENTISTRY, 125 W. 31 St., N. Y. C. ★

**START OWN BUSINESS RESILVERING MIRRORS, REFINISHING METAL**, plated articles, auto parts, reflectors, tableware, etc. Experience unnecessary. Small investment. Combination outfit. Write **SPRINKLE, Plater., 129A, MARION, INDIANA**

**Men & Women Earn Cash at Home!**

Mrs. M. M. earned \$267 in 3 weeks (sworn statement) raising mushrooms for us in her cellar! Exceptional? Yes, but your cellar, shed, barn may be suitable to bring moderate income all winter. Book, sample free. Est. 1908. UNITED CO., 3848 Lincoln Ave. Dept. 101 CHICAGO

When writing please mention Popular Mechanics





## Build a BOAT

FOR PLEASURE OR PROFIT



*Shows*

### EXACTLY HOW TO BUILD 15 DIFFERENT BOATS

This is the new edition with 42 added pages, 6 new boats, and conversion of Ford motor for marine use. Full directions and details for cabin cruiser, racing, hydroplane, outboard runabout, sail boats, kayak, sea sled—15 boats in all. Also sectional boat to carry on car.

### SEND NO MONEY

Write for new edition of Boat Book today! Sent anywhere. Pay postman \$3.00 plus few cents postage. Outside U. S. and possessions remit with order. Money refunded if not satisfied.

POPULAR MECHANICS PRESS—Room 436A  
200 East Ontario St., Chicago

### EASY—LOW COST with POPULAR MECHANICS BOAT BOOK

Build a boat at home! You can do it. Just the kind you've wanted—power, sail, or row boat. The "Boat Book" shows you how in simple step-by-step directions. Specially prepared for those with limited tools, little skill and money. Build boats to sell for profit too. Book tells how.

### GIVES PLANS, METHODS AND MATERIALS

Actual working plans and photos of real boats under construction makes building easy. Shows materials needed and rock-bottom costs. Hundreds of pictures. No chance for mistake. Includes also—navigation and pilot rules, haul, dling sailing craft, boat kinks, boating terms. Everything a boat enthusiast should know. Size 7x10 inches. 312 pages. Fine cloth binding.

## MAKE MONEY with "SHOP NOTES"

Ideas, Kinks, Helps

### 1936 SHOP NOTES and LATHE HANDBOOK

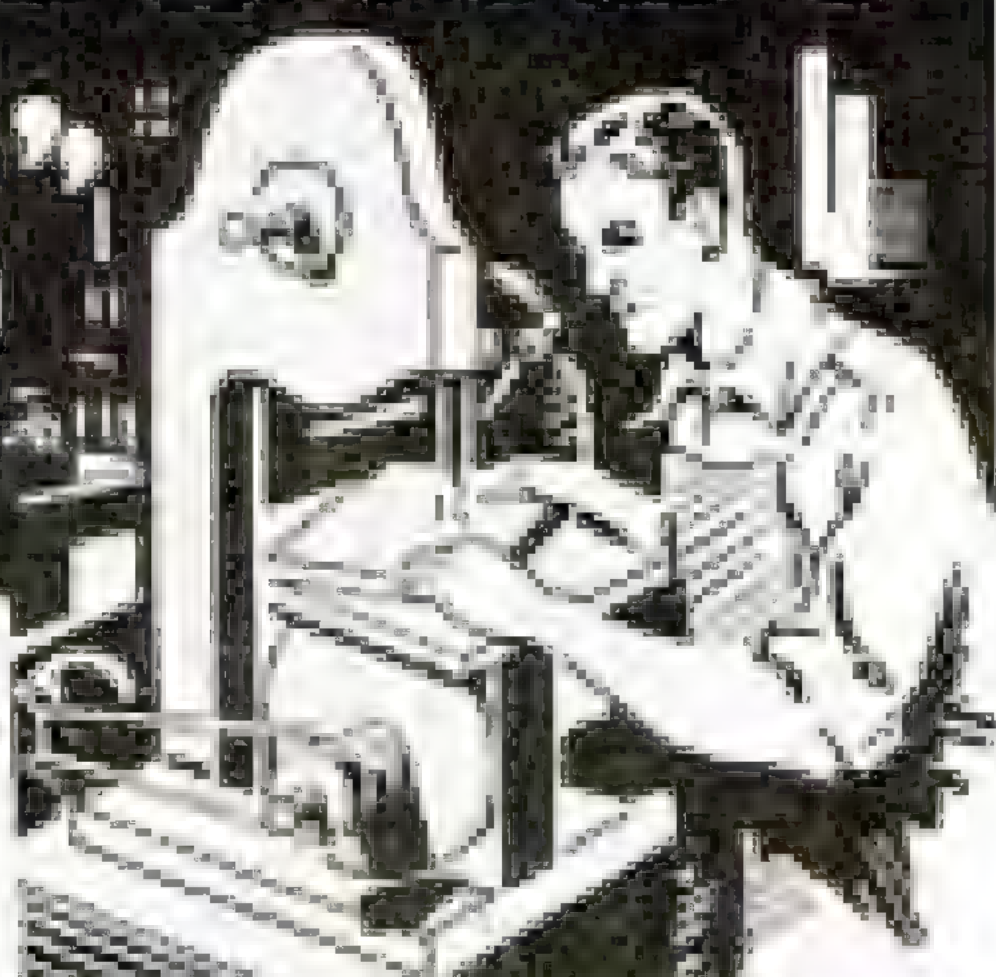
Extra Big Book  
Value—ONLY **98¢**  
For Both

Be the man who knows the easiest and best ways of doing things—the fellow who is up-to-date—cash in on handy kinks and short cuts. Get Shop Notes for 1936 and make money. For many years the helpful, handy guide for men doing mechanical, carpentry, auto repairing, concrete, plumbing, electrical, building, masonry, farming, home repair work, etc. Now ready—1936 edition and famous Lathe Handbook—both for only 98 cents.

### 2000 Money Making Ideas for Shop and Handy Men

Get the Shop Notes Library. Complete set 5 books—Over 800 pages—2000 pictures—2000 money making facts, methods, processes and time saving kinks. They'll pay for themselves over and over. Whole set only \$2.50. Order now. Supply soon exhausted.

Popular Mechanics Press, Room 436A, 200 East Ontario St., Chicago



A FEW OF 360 ARTICLES  
IN 1936 SHOP NOTES  
Shop Notes for 1936 has 224 pages—360 articles—793 illustrations. Some of the subjects are:

Air Conditioning  
Auto Owner Helps  
Auto Service Kinks  
Brake Tester  
Drill Press Work  
Electrical Kinks  
Furniture Making  
Lathe Operating Kinks  
Model Makers Helps  
Sander for Lathe  
Sheet Metal, Things to  
Do With  
Tool Kinks  
Welding and Cutting  
Wood Turning Helps  
Workshop Kinks

### SEND NO MONEY!

Combination offer above 98 cents. Shop Notes Library—5 books—\$2.50. Pay postman plus few cents delivery in U. S. and possessions. Elsewhere remit with order. Order now.



*Insure Your  
Success for Life*

## Learn ELECTRICITY TELEVISION & RADIO

Enroll  
in the oldest  
largest trade  
School in  
West.  
Est. 1905

30,000  
Graduates

Thousands of  
dollars worth  
of latest  
equipment in  
National's labora-  
tories and studios  
for you to learn on.

### LEARN IN LOS ANGELES

Learn by practical actual shop-methods. Full instruction in Electricity, Television, Radio, Talking Pictures and Commercial and Broadcast Operating. National's all-inclusive course qualifies you for a successful, profitable future in the actively growing fields of Electricity, Radio and Television. Training meets U. S. Govt. license requirements. We help students earn room and board while learning. Coach R. R. fare allowed to L.A. from any part of U. S. 30,000 graduates. Oldest, largest Trade School in West.

MAIL COUPON FOR FREE BOOK



*Be master of the most  
active, best-paying  
Trades. We teach you  
to quickly qualify.*

### NATIONAL SCHOOLS

Dept. PMR-4, 4,000 So. Figueroa, Los Angeles, Calif.

NAME.....  
ADDRESS.....  
CITY.....STATE.....

## AIR CONDITIONING ELECTRIC REFRIGERATION

Send for  
FREE  
Booklet  
NOW

Men needed now in this new, fast-growing field. If you want steady work—all year 'round—good pay, or a business of your own, prepare NOW. Such ground-floor opportunities are rare. Learn at low cost right in your own home (or at our school in Chicago). Write today for FREE Booklet.

CHICAGO TECHNICAL COLLEGE 32nd  
D300 Tech. Bldg., 118 E. 26th St., Chicago Year

## A Shortcut to BUSINESS TRAINING

NEWER—QUICKER—SIMPLIFIED!

LOW  
COST  
HOME  
STUDY

NEW, complete, shortcut "Business Tech" course trains you, at home, for promotion and more pay. One-third the usual cost and in a fraction of the time. Get out of the rut—and on the road to success—quickly, easily. FREE book tells how. Mail coupon for it TODAY.

Institute of Business Technology,  
Dept. AE-306, Chattanooga, Tenn.

INSTITUTE OF BUSINESS TECHNOLOGY,  
Dept. AE-306, Chattanooga, Tenn.

Please send me your FREE book and details as to how I can "Shortcut" to promotion and more pay, at home, in spare time.

Name.....  
Address.....  
City.....State.....

When writing please mention Popular Mechanics



**Full Size Professional**  
**ARC WELDER** Only \$29.50



**Amazing Machine, with Efficiency of Arc Welders Selling for \$145.00 and More Offered at Breath-Taking Low Price**

**Now You Can Own a Complete, Full Size, Electric ARC WELDER for Personal or Shop Use—or Go into Welding Business for Yourself!**

Here's thrilling news! A full size, heavy duty Commonwealth Electric ARC WELDER—only \$29.50! Not a toy, but a big, 150-pound man-sized machine that does all types of welding, uses all kinds of rods, welds all metals and alloys with equal efficiency—everything from heavy motor blocks to fenders. Welded steel has strength of 70,000 pounds per square inch. The Commonwealth is a sturdy, welded-steel-construction machine, yet easily portable on casters.

### Works from 110-Volt Socket

Simply plug into any light socket with 110-volt A.C. current. Then you're ready to weld! Economical—costs only a few pennies an hour to use. Often pays for itself on first or second job. Comes complete with goggles, welding rod, tongs, etc. Nothing else to buy. (Flux for soldering and carbon for brazing also supplied.) Equipped with safety fuse. Crystalline Finish cabinet. Simple, complete instructions show you how to do even complicated jobs easily, quickly, without experience. Learn welding trade—good jobs always open for welders.

**30 DAYS TRIAL** Send only \$10.00 now. We will ship Commonwealth ARC WELDER complete to you, f. o. b. Cincinnati by freight C. O. D. for balance of \$19.50. (Shipping weight, approx. 160 lbs.) Use 30 days at our risk. If not delighted, return machine and we'll refund money you paid us for it. If you want complete illustrated details before ordering, rush name and address to

**COMMONWEALTH MFG. CO.**  
Dept. C-12, Oakley Cincinnati, Ohio

**SEE WITHOUT GLASSES!**



**The NATURAL EYESIGHT SYSTEM Gives Your Eyes a New Deal**

If you wear glasses, or think you should, our **FOUR MONTHS' TRIAL OFFER**—containing the inspiring story of glasses discarded for Nearsight, Farsight, Astigmatism, Old Age Sight, Eyestrain, Weak Eyes, Eye Muscle Trouble, Etc., as told by **USERS AT HOME** of this Revolutionary System—will be mailed **FREE** upon request.

**NATURAL EYESIGHT INSTITUTE, INC.**  
Dept. 64-H Los Angeles, Calif.

**VEST POCKET ADDING MACHINE**



Adds, Subtracts, Multiplies, Divides. Does work of costly machines. Not a toy, \$250,000 dollar capacity. Simple and accurate. Guaranteed 5 years.

**FREE TRIAL —SEND NO MONEY—** **\$2.50** Total Cost


Just name and address. We will ship Calculator immediately. On delivery pay postman \$2.50 (plus few cents postage). (If outside U. S. send cash). 30c additional in Leatherette Case. If not satisfied after 10 days' trial you get your money back. **THOUSANDS OF SATISFIED USERS.** Write for Agents' Proposition. **CALCULATOR MACHINE CO. (Infrs.)** P. O. Box 1718, Dept. 31, CHICAGO, ILLINOIS.

**ART LESSON FREE**



Test your own ability. You study from large photos of artists' models just as they pose in the life class. We will gladly send you the first lesson of **Towertown Studios Head and Figure course** absolutely free. You are the sole judge. Just send your name and address and 10c to cover mailing cost. No obligation.

**Towertown Studios, Inc., Dept. 436**  
520 N. Michigan Avenue, Chicago, Ill.

 Balance as above with 1-50; 1-20; 2-10; 1-5 and 2-2 gram weights based 1/4"x3 1/4"—\$4.75. Catalog with 3000 illustrations of laboratory apparatus sent for 50c. Catalog listing 10,000 chemicals, drugs, dyes, etc. and 1700 scientific books sent for 25c; Wholesale Price List 1000 Ill. 10c.

**Laboratory Materials Company, 639 E. 71st St., Chicago, Ill.**

## 900 WORKSHOP IDEAS

Why "putter" when you can make hundreds of articles for beauty, utility and dollar and cent profits?

**"Make It Yourself"**

Newest edition: 480 pages, 823 pictures. Size: 7x10x1 1/2 inches. Sent postpaid anywhere upon receipt of price or C.O.D. in U.S.A. paying postman price and postage. **\$3**

Send for 44f  
**POPULAR MECHANICS PRESS**  
Room 436

200 E. Ontario St. Chicago

**INCLUDING:**  
Toys, Models  
Furniture  
Garden Equipment  
Home Repairs  
Sports Equipment  
Auto Kinks  
Radio Equipment  
Workshop Tools  
and Machinery  
Articles on Work-  
ing:  
Wood, Metal,  
Leather, Glass,  
Etc. Etc. Etc.

## \$ MONEY-MAKING \$ OPPORTUNITIES

For those who need larger incomes or must seek new occupations. The following workable, tested plans are adaptable both to the needs of the country or city dweller either for part time development or principal income source.

Every idea set forth in these books has been used by others for profit. They are well worth your consideration.

**Plan No. 1—1000 Ways to Make \$1,000.** Practical new book of tried, tested methods that work that you too, can use. Price \$2.65.

**Plan No. 2—Radio Servicing.** Let an expert teach you how to engage in this money making business. Price \$4.15.

**Plan No. 3—Refrigeration Service.** Official manual covers all makes. Good service men are needed. Price \$5.00.

**Plan No. 4—Automobile Refinishing.** Start a lucrative business of your own. Fine possibilities here. Excellent new instruction book. Price \$1.50.

**Plan No. 5—Outdoor Opportunities.** The raising of small animals, birds and plants for profit. Price \$2.00.

**Plan No. 6—10,000 Money-Making Formulas.** Complete instructions for the making of commodities at small cost that may be sold at a handsome profit. Price \$4.00.

**Plan No. 7—1000 Spare Time Money Making Ideas.** A job for everybody. 140 page book tells how. Price \$1.00.

**Plan No. 8—100 Civil Service Examinations.** Covering steady Government jobs. All types of positions. Better business means thousands of new jobs. Prepare now by studying this new book. Price \$2.50.

**Plan No. 9—Making Poultry Pay.** The proper breeding and management of fowls for higher egg production. Price \$2.00.

**Plan No. 10—Fur Farming for Profit.** Complete instructions that enable the beginner to succeed from the start. Price \$4.00.

**Plan No. 11—Rabbits for Food and Fur.** A complete guide to the successful rearing and breeding of rabbits. Price \$2.00.

**Plan No. 12—The Frog Industry.** Should be considered more as a side line than as a major means of income. Price \$2.00.

**Plan No. 13—How to Live on a Subsistence Homestead.** Facts and figures on how one family fled from the city and found security and independence. Price \$2.50.

**Plan No. 14—Auto Service Shop Management.** Money-saving and business-producing ideas by two men who know just what is essential to a profitable service shop business. Price \$1.50.

Any of the above mailed postpaid upon receipt of price or sent C.O.D. anywhere in U. S. Pay postman price and few cents postage.

**POPULAR MECHANICS PRESS**  
Room 436 200 E. Ontario St. Chicago, Illinois

When writing please mention Popular Mechanics



# MEN Wanted

## to Qualify for Positions in New Industries AIR CONDITIONING ELECTRIC REFRIGERATION

We want to personally interview, at our own expense, a number of ambitious men—aged 21 to 40—in various localities. We will select as many as possible to qualify for positions in America's two fastest-growing industries. The men we select will be trained for installing and servicing all kinds of domestic and commercial Air Conditioning and Electric Refrigeration equipment. Do not reply unless you are mechanically inclined, have fair education and are employed at present at least part time. Character references required. You must be willing to study during spare time for few months at some cost to you. Write giving full details of age, education and present occupation.

**UTILITIES ENGINEERING INSTITUTE** EST. 1927  
400-410 N. Wells St., Dept. 146, Chicago, Ill.

## Wrestling Book FREE



Learn to be an expert wrestler. Know scientific wrestling, self-defense, and Jiu-Jitsu. Develop a splendid physique, and health. Lessons prepared by famous WORLD'S CHAMPIONS **Frank Gotch and Farmer Burns**. Easily, quickly learned at HOME. Be strong, be skillful, learn the science, the tricks, the SECRETS. Handle big men with ease. The all-around health exercise. A WONDERFUL opportunity for boys and also for businessmen! Write TODAY for splendid FREE BOOK—prospectus—tells all about this 36-year old school. Send 3 cents for postage. BOOK FREE—State your AGE.

Farmer Burns School of Wrestling 3374 Elwood Bldg., Omaha, Neb.

**PINS 35¢ Rings 1.65**  
CLASS PINS—any letters, any year, any colors. Silver plated, 1 to 11, 48¢ ea; gold plated, 50¢ ea; sterling, 60¢ ea. Silver plated, 12 or more, 35¢ ea; gold plated, 48¢ ea; sterling, 50¢ ea. Sterling silver rings as shown, 1 to 11, \$1.50 ea; 12 or more, \$1.65 ea. Write for Big FREE Catalog showing hundreds of pins, rings, medals, emblems, trophies, etc.

**METAL ARTS CO. INC. FACTORY 44 ROCHESTER, N.Y.**



## MIDGET ELECTRIC RADIO

Wt. only 2 lbs. Real miniature LOUD-SPEAKER built in. Also only 3 1/2 x 5 1/2 x 3 1/2 (smallest real radio built). Easily carried in any large pocket or in traveling bag. Two triode hi-gain tubes—built in aerial. Tunes in all stations loud and clear—distant reception. Ideal second or personal radio. Operates on any 110 volt A. C. or D. C. current. Kit of parts and diagram for \$6.49. COMPLETELY WIRED AND TESTED FOR ONLY 50¢ extra or \$6.98. Send only \$6.98 (cash, money order, check) and pay postman balance plus postage on arrival. GUARANTEED to operate anywhere. ORDER NOW!

Tinytone Radio Co., Dept. P-4, Kearney, Nebraska

## NEW TYPE CHEAP OIL BURNER Sweeping the Country!!

### COOK and HEAT Without Coal or Wood

In Your Present Stove or Furnace—**HOTTER—CHEAPER—No Dirt or Ashes—Twice the Heat Quick at HALF THE COST.**

### COOKS A MEAL for LESS

Beats any oil burner ever gotten out for low cost, perfect performance. Burns cheap oil a new way, without pre-generating or clogging up. Quick intense heat by Simple Turn of Valve.

### Try At Our Risk 30 DAYS' TRIAL

Prove it ends drudgery and dirt of coal or wood; cuts fuel bills in half, pays for itself quickly by what it SAVES.

### FREE SAMPLE FOR AGENTS

offered to one energetic man or woman in each locality who will demonstrate and take orders. Write quick, be first to learn how to make REAL MONEY right now, spare or full time—mail in postcard today. **UNITED FACTORIES, D-751 Factory Bldg., Kansas City, Mo.**

### AGENTS Salesmen BIG MONEY

Drop Everything for this Quick Seller. Clark of Ind., sold 33 in 20 days. Get YOUR OWN oil burner FREE and make REAL Money. Write now.



Slips into  
Any STOVE  
RANGE or  
FURNACE

**Quick HEAT at  
Turn of Valve!**

## Learn this Fascinating, Profitable Profession



## in 90 Days, at Home

Hundreds of men and women of all ages 18-50 are making \$10.00 to \$20.00 a day giving scientific Swedish Massage and Hydro-Therapy treatments. There is a big demand from Hospitals, Sanitariums, Clubs, Doctors and private patients. The field of reducing alone offers great possibilities.

Learn this interesting money-making profession in your own home by mail through our college extension course. Same instructors as in our NATIONALLY KNOWN resident school; same diploma awarded. Course can be completed in 3 to 4 months. No High School training necessary.

Many earn big money while learning. Enroll now and we will include anatomy charts, medical dictionary, patented reducing roller and Hydro-Therapy supplies without extra cost. The reducing course alone may be worth many times the modest tuition fee. Send coupon for special reduced price offer. Complete details with list of successful graduates will be sent free.

### National College of Massage & Physio-Therapy

Dept. 464—20 N. Ashland Boulevard, Chicago

You may send me FREE and postpaid, your illustrated catalog and details of your special offer, also list of successful graduates.

Name.....

Address.....

City.....State.....

## Be An ARTIST



### Make \$50 to \$100 a Week Learn at Home This Amazingly Simple Way

More and more trained Artists are needed each year. 28,531 magazines, advertisers, newspapers, printing houses, etc., pay good money for art work. Our simple, proven, personalized method makes it fun to learn Commercial Art, Cartooning and Designing quickly, AT HOME, in spare time.

### Big Artist's Outfit Given

Drawing board, paints, brushes and all materials you need to learn and earn come with very first lessons. Actual fun learning to draw this new way. Be an artist and make big money!

### Send for FREE BOOK

Our big Free Book describes latest developments and wonderful opportunities in this fascinating field and gives full details of this quick, simple method. Tells all about our students—their successes—what they say—actual reproductions of their work — and how many earned big money even while learning. Mail coupon below or postcard today. State age. (No salesman will call.)

## Free Book shows how

Washington School of Art, Studio 124  
1115—15th St., N. W., Washington, D. C.

Please send me, without obligation, your Free Book, "Art for Pleasure and Profit."

Name.....Age.....

Address.....

City.....State.....

When writing please mention Popular Mechanics





*They Said I Couldn't  
Do It. But Here It Is  
my 1936 OFFER*

**WEAR A WATCH  
OR DIAMOND**

**30 Days FREE!**  
*then Make Your Own Terms*



My confidence in YOU; my confidence in my standard, dependable watches and beautiful genuine diamonds, and my confidence in business conditions cause me to make this unheard-of offer. I am going to place as many watches and diamonds in the hands of men and women throughout the land as possible in 1936 NO MATTER WHAT THE SACRIFICE, because each watch and diamond will act as a salesman to sell another.

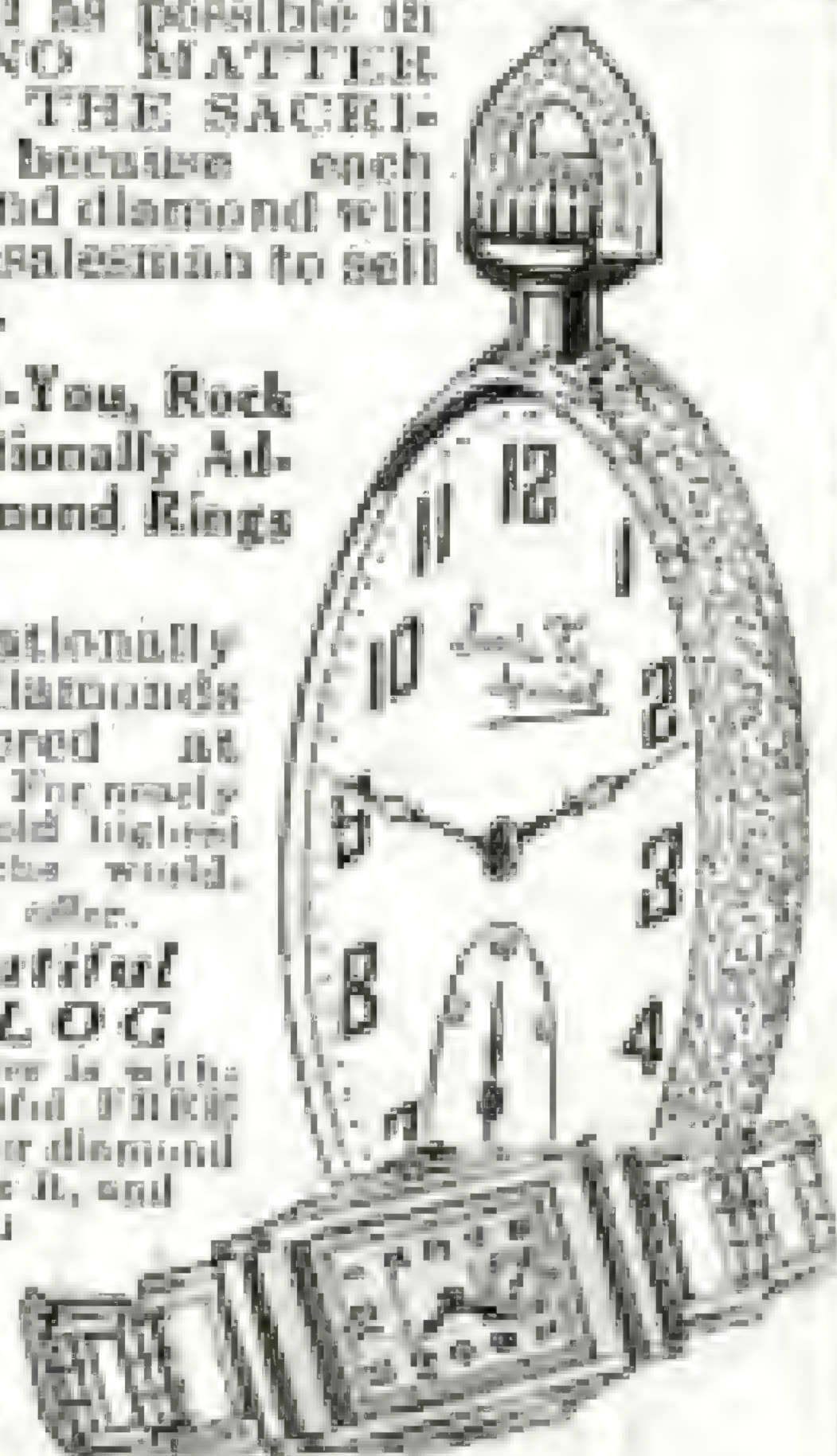
**Direct-to-You, Rock Bottom Prices on Nationally Advertised Watches, Diamond Rings and Silverware.**

What an offer! Nationally advertised watches, diamonds and silverware offered at lowest direct-to-you prices. For nearly a half century we have sold highest quality jewelry all over the world. And now this remarkable offer.

**Send for Beautiful FREE CATALOG**

Write now—before this offer is withdrawn and get the beautiful FREE Catalog. Select the watch or diamond you want, wear it, examine it, and then write us the terms you desire.

**SANTA FE WATCH COMPANY**  
46 Thomas Bldg., Topeka, Kan.  
We Buy OLD GOLD and STERLING SILVER



**84 CARD TRICKS 10c**

Latest and most mystifying card tricks now explained in new, illustrated book. Tells how to make the "pass," deceptive shuffles, forcing a card, etc. As popular as parties or earn money in spare time. Price 10c. Book of Coin Tricks, 10c. Book of 153 Parlor Tricks, 10c. All three books, 25c.

FRANKLIN PUBLISHING CO., 800 N. Clark St., Dept. 9482, Chicago



**CHROMIUM PLATING ALSO COPPER AND NICKEL**

The secrets of fully explained in Shop Notes for 1933. Illus. 50 cents, postpaid.

Popular Mechanics Press, 200 E. Ontario Street, Chicago

**BIG LEADER — SELLS ON SIGHT**

**GENUINE LEATHER TIES  
LOOK LIKE SILK**

For Men and Boys. Durable, neat—won't wrinkle, and can be cleaned with a damp cloth.

**NOTE: We are the manufacturers and originators of the famous "Century" Tie.**

Be Independent: have your own business. Big profits, repeat orders. Young man sold 23 one night after school. No sales ability needed. Send 50c or stamps for sample and kit. Information free. LADIES, also, are proving very successful with the "Century" line.

**CENTURY TIE CO.**  
Dept. A, 2345 W. Grand Blvd.  
DETROIT - MICH.

40  
Patterns

When writing please mention Popular Mechanics

**"KNEE ACTION"**  
for Your **BICYCLE**



Float over cobble stones with 1936 Packard smoothness. Sail over curb stones with hardly a jar. Ride miles farther and faster without getting tired. Anybody can attach KNEE ACTION quickly to any make or size bicycle in two minutes with a wrench. Nothing to wear out or get out of order.

**ONLY \$1.00 COMPLETE**

Lasts a lifetime. Be first in your town. **SEND NO MONEY!**—Rush postcard for your KNEE ACTION and instructions. Pay postman only \$1 plus few cents postage on delivery. If not delighted in 15 days, return and we'll refund your dollar. We include FREE details on how to make money selling to friends.

**PACKARD KNEE ACTION CO., Dept. Z-957**  
4306 Marburg Ave. Cincinnati, Ohio

**OIL HEAT**

At Amazing  
**Low Cost!**



**Get FREE BOOK!** LACO's exceptional 1936

Automatic Oil Burner brings you New Fuel Economy—New Quietness—New Low Prices! \$80 to \$100 less than others! Cuts fuel costs 25%! More heat from cheapest oil. Only 1 moving part—nothing to cause trouble. Approved by Underwriters Lab. Built by one of world's largest manufacturers. Over 20,000 in use. Be modern—and furnace drudgery forever.

**WRITE** See your LACO dealer. If none near you, send today for special Low Direct Offer!  
**LACO OIL BURNER CO., 146 Union St., Griswold, Iowa**

**Special offer to DEALERS**

LACO sales doubled this year. I need more dealers to make installations. Get my shipped-on-approval, sample-burner plan. Write quick, L.A. COCKLIN, Pres.

**WANTED MEN**

**OPERATE POTATO CHIP STORES**

We furnish everything—help finance and locate you. No experience needed. Tremendous profits. Sensational introductory starting plan. No house-to-house canvassing. Wonderful opportunity. Rush name for free book of Profit Facts—today!

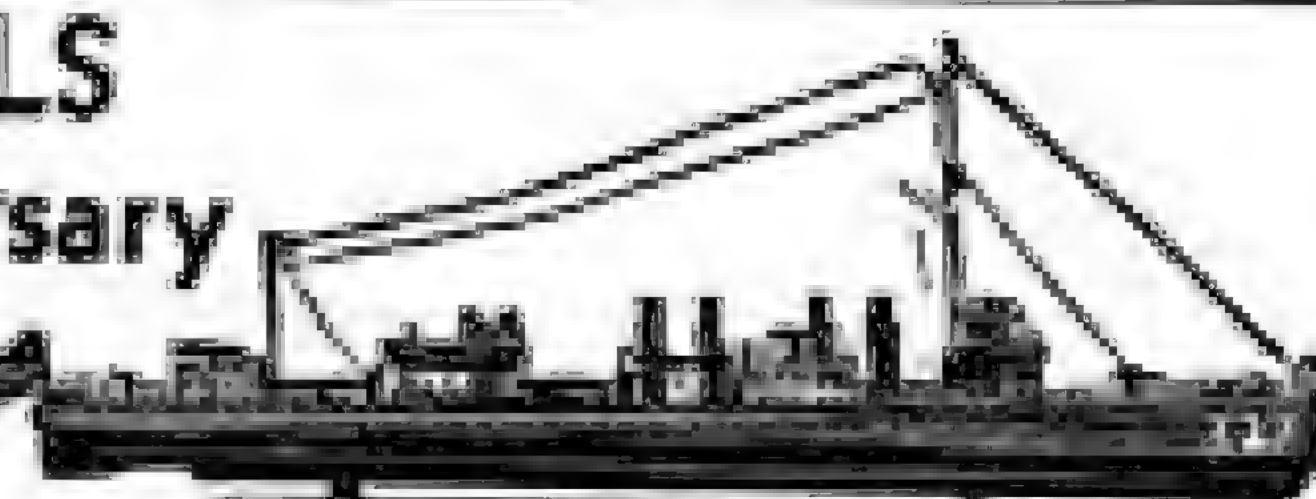
**LONG-EAKINS COMPANY**  
428-S High Street, Springfield, Ohio



**SHIP MODELS**

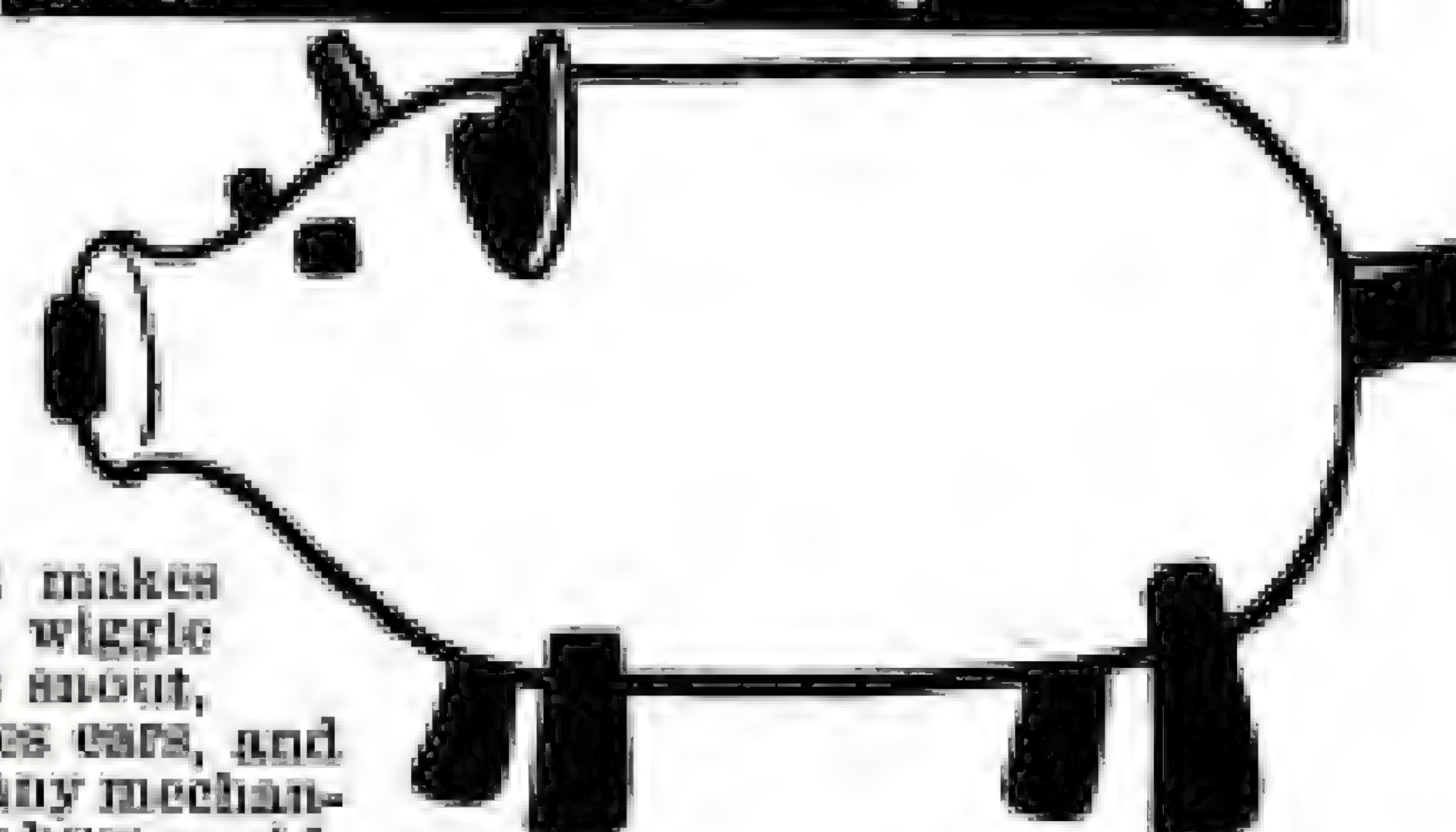
**Tenth Anniversary  
SALE SPECIALS**

Our large tenth anniversary photographically illustrated catalog just off the press. Many items at reduced prices. Complete kits from \$1.00 up. Also special parts such as blocks, deadeyes, steering wheels, anchors, etc., will be mailed postpaid upon receipt of 10 cents (coin). Don't delay to send for this 64-page booklet, which also contains hints for building ship models. Model Ship Supply Co., Dept. M, Mineola, N.Y.



**A MYSTERY PIG!**

**BIG  
LAUGH**



Mysterious! Everyone will wonder what makes the mystery pig wiggle... he twists his snout, blinks eyes, wiggles ears, and wags tail without any mechanical contrivance or human aid. Hours of fun watching Mr. Pig do his stuff. Great for parties for men, women and young folks. Fool your friends... they'll wonder what makes it work. They can't tell unless you reveal secret. Nothing to get out of order. Lasts indefinitely. Fits in vest pocket or purse. **SEND 35c or \$1.25 FOR 4 (CANADA 35c EA. 3 FOR \$1.) U. S. MONEY ONLY—STAMPS NOT ACCEPTED.** Money back if not 100% satisfied. Order today. You never saw anything like it. It's the newest invention novelty of the day. **Big Illustrated Catalog of many tricky novelties 10c.** FRABER SALES, Dept. 504, Box 35, Ft. Hamilton, Brooklyn, N. Y.



LET THESE GREAT BOOKS  
HELP YOU TO

**Start Your Climb!**

*"the Man  
who KNOWS  
is the Man who WINS"*

Easy to train yourself! These  
books have helped thousands—

**AIR CONDITIONING**  
Live Field; Great  
Future.....\$3.50

**AUTO ENCYCLOPEDIA**  
The Famous Dyke's La-  
test Edition.....\$6.00

**110-V. GENERATORS**  
Made From Old Auto  
Units.....\$1.00

**BIRD HOUSES**  
Build to Sell; Easy De-  
signs.....\$1.00

**BOAT BOOK**  
Power, Sail, Rowing,  
Paddle Plans.....\$3.00

**BOY MECHANIC**  
Hundreds Things Boys  
Can Make.....\$2.00

**BUILT-IN FURNITURE**  
Take Orders, Make  
Money!.....\$2.50

**CARPENTRY HANDBOOK**  
336 Practical Short-  
cuts.....\$1.50

**CHEMISTRY, PRACTICAL**  
Make Hundreds Things  
Daily Use.....\$2.00

**CONCRETE WORK**  
173 Uses Described,  
Pictured.....\$1.00

**DIESEL HANDBOOK**  
New! Latest Informa-  
tion.....\$5.00

**DOG TRAINING**  
Home, Stage, Movies,  
Etc.....\$1.50

**ELECTROPLATING**  
Modern Practice Includ-  
ing Nickel, Zinc, Cad-  
mium and Chrom-  
ium.....\$2.25

**FARMERS' BOOK**  
501 Kinks for Field,  
Home.....\$1.00

**V-8 FORDS**  
Also "A" and "B"  
Models, All New!..\$2.50

**FORMULAS**  
10,000 Money Mak-  
ing.....\$4.00

**FROG INDUSTRY**  
New! Raise and Sell.  
Profits!.....\$2.00

**FURNITURE MAKING**  
Tools, Materials, De-  
signs.....\$2.50

**LATHE WORK (Metal)**  
Drilling, Threading.... 75c

**LOCOMOTIVE**  
Folding Chart Shows all  
Parts.....\$1.00

**LOG CABINS**  
Easy Plans; Build for  
Profit. Value!.....\$2.50

**MATHEMATICS**  
Easy Guide for the Prac-  
tical Man.....\$1.50

**MECHANICAL DRAWING**  
Learn Drafting; Good  
Salaries.....\$1.00

**MONEY MAKING IDEAS**  
1000 Spare Time.....\$1.00

**OCEAN LINER "EUROPA"**  
Atlantic Speed Queen;  
Charted.....\$1.00

**PLUMBING**  
500 Facts Every Home-  
owner Should Know..\$1.50

**POULTRY**  
Breeding, Management,  
Protect Your Profit!..\$2.00

**PRECIOUS METALS**  
Identify—Buy—Sell.  
Only book on.....\$1.00

**PROSPECTORS' HAND-  
BOOK**  
How to Mine, Appraise,  
Equip.....\$3.00

**RADIO**  
Amateurs' Handbook;  
Circuits, Repairs,  
Etc.....\$1.00

**RADIO SERVICING**  
Profit by Knowing  
Costs, Kinks, Etc!..\$4.00

**REFRIGERATION**  
Electric, Gas, Sea  
Service Expert.....\$4.00

**REWINDING ELECTRIC  
MOTORS**  
Fractional Sizes. Value!..\$2.50

**SHIP MODEL**  
Entire Text, Famous  
"Sovereign" of 1837..\$1.00

**SHOP NOTES LIBRARY**  
5 Vol. 2000 Wonderful  
Shop Ideas.....\$2.50

**STAMP ALBUM**  
Modern. 400 Pages...\$1.00

**STEEL SQUARE**  
How to Figure Angles  
of Rafters, Roofs, Etc..\$1.00

**STORAGE BATTERIES**  
New! How to Build,  
Repair, Charge....\$2.50

**TOYS**  
For Amusement or Prof-  
it. Saleable Designs..\$1.50

**UPHOLSTERY**  
Always a Big Market.  
Start Own Business..\$1.60

**WELDER'S HANDBOOK**  
Oxy-Acetylene. Covers  
Gas Welding.....\$2.00

**WIRING**  
Approved Economy  
Methods for Homes,  
Buildings.....\$2.50

**WOOD TURNING**  
Woods, Tools, Methods;  
Practical Teacher...\$1.50

**WRIGHT ENGINE**  
Chart of "Whirlwind";  
All Parts.....\$1.00

**Books sent C.O.D. anywhere in U.S.**

Just check the books you want, write your name and address be-  
low, and mail the advertisement. It is your order blank. When  
postman hands you books, pay him the price and few cents postage.  
If you send remittance when ordering, please include 10 cents per  
book extra for postage. Write for information about books on  
other subjects you are interested in.

Name.....

City.....State.....

Address.....

Mail to Popular Mechanics Press,  
Room A6—200 East Ontario St., Chicago, Ill.

When writing please mention Popular Mechanics

## AUDELS Carpenters and Builders Guides 4 vols. \$6



**Inside Trade Information**  
for Carpenters, Builders, Join-  
ers, Building Mechanics and  
all Woodworkers. These  
Guides give you the short-cut  
instructions that you want—  
including new methods, ideas,  
solutions, plans, systems and  
money saving suggestions. An  
easy progressive course for the  
apprentice and student. A  
practical daily helper and  
Quick Reference for the master  
worker. Carpenters every-  
where are using these Guides  
as a Helping Hand to Better  
Work, Better Work and Bet-  
ter Pay. To get this assist-  
ance for yourself, simply fill  
in and mail the FREE COU-  
PON below.

### Inside Trade Information On:

How to use the steel square—How to file and set  
saws—How to build furniture—How to use a  
mitre box—How to use the chalk line—How to use  
rules and scales—How to make joints—Carpenters  
arithmetic—Solving measurement problems—Es-  
timating strength of timbers—How to set girders  
and sills—How to frame houses and roofs—How to  
estimate costs—How to build houses, barns, ga-  
rages, bungalows, etc.—How to read and draw  
plans—Drawing up specifications—How to ex-  
cavate—How to use settings 12, 13 and 17 on the  
steel square—How to build hoists and scaffolds—  
skylights—How to build stairs—How to put on  
interior trim—How to hang doors—How to lath—  
lay floors—How to paint.



**THEO. AUDEL & CO., 65 W. 23rd St., New York City**

Mail Audels Carpenters and Builders Guides, 4 vols., on 7 days' free trial. If O.K.  
I will remit \$1 in 7 days, and \$1 monthly until \$6 is paid. Otherwise I will return them.  
No obligation unless I am satisfied.

Name.....

Address.....

Occupation.....

Reference.....P.M.

## Be a TELEVISION EXPERT

### LEARN TELEVISION with RADIO—NOW!

Fine opportunity for experts in this  
amazing new industry. A NEW busi-  
ness in a NEW era offers NEW oppor-  
tunities for big salaries! You learn  
Radio and Television from beginning  
to end in our marvelously equipped  
labs and studios. You actually operate  
thousands of dollars worth of expen-  
sive equipment. You get expert in-  
struction and skilful guidance by  
radio-television specialists.

### Demand for Television Experts

Television now perfected and ready  
for the market ON THE NEXT BIG  
BUYING WAVE. Business leaders predict  
new system television will require thou-  
sands of relay and broadcasting stations.  
Ultra-short waves will permit eighty thou-  
sand television stations in America alone.



**FREE FOLDER**

**S. Q. NOEL, Pres. First National Television, Inc.**

Dept. A-4 Power & Light Bldg., Kansas City, Mo.

Without obligation, send me postpaid FREE Illustrated Folder "Pictures On the  
Air", telling about new opportunities in television. I am 17 years or older

Name.....

Address.....

BIG FUTURE  
USE COUPON



**REDUCED 8 INCHES!**

"... Please send me a Weil Reducing Belt for a 38 inch waist. The first one I got was a 46—this one should be 8 inches smaller."  
W. L. McDermott  
Livestock, Cal.

**REDUCED 50 POUNDS!**

"... This is a belt of great value and I find it has reduced my weight from 250 to 180 pounds."  
W. T. Anderson  
Richmond, Va.

**"REDUCED MY WAIST 8 INCHES"**



**Why Don't YOU Test the Weil Belt at Our Expense?**

You will appear many inches slimmer at once and in ten short days your waist line will actually be 3 inches smaller... 3 inches of fat gone or no cost!

**Massage-Like Action Does It!**

You will be completely comfortable as the massage-like action gently but persistently eliminates fat with every move! Gives erect, athletic carriage... supports abdominal walls... keeps digestive organs in place... greatly increases your endurance. Experiences of thousands of men justify us in making you this unqualified agreement:

**REDUCE your WAIST 3 INCHES in 10 DAYS... or no cost!**

Simply write name and address on postcard and we will send you illustrated folder and full details of our 10 DAY FREE TRIAL OFFER.

**THE WEIL COMPANY, 564 Hill St., New Haven, Conn.**

**NO DRUGS,  
DIETS OR  
EXERCISES**

**SEND FOR 10 DAY FREE TRIAL OFFER**

**Turn JUNK TIRES  
IN TO Cash! START  
AT HOME**

**The Most Sensational  
Business Opportunity  
Since 1929**

Like turning lead into gold, here is a business with gigantic possibilities. Factories, Clubs, Stores, Schools, Homes, spend millions every year for rubber mats. Think of your profit when a

**HAND  
MACHINE  
and**

**5¢ TIRE  
MAKES \$2.00 MAT**

Brand new. Fully patented. Few men already started report unprecedented success. Wm. Eagle writes: "Can't make mats fast enough. First week brought over 200 orders for \$1.00 to \$10.00 each." Flash from Harris says: "Orders enough to keep 15 men busy all the time." Gunter got big order from County Commissioners and now reports: "Just signed up order for all Grade Schools and High Schools." No wonder responsible men are throwing everything else aside to establish local FABRIX factories.

**COSTS NOTHING** to get complete facts. Just send name and address. We'll send description of simple hand machine that quickly slices old tire into strips; show you how patented method forms strips into thick, springy, long-wearing FABRIX Mats—how five cents worth of Junk Tires makes a \$2.00 Mat; how you can start on a reasonable investment and build a business as big, so fast, that it will take your breath away. Don't delay a minute. Write or wire today. All information is free.

**FABRIX, Inc., 325 W. Huron St., Dept. 74, Chicago, Ill.**

When writing please mention *Popular Mechanics*

**Make up to \$95 Weekly!**  
**Hand Out FREE CIGARETTES**

**Show Men New Way To Smoke**

We'll furnish you Free Cigarettes to give away in your locality. Ask any man to have a Free Smoke. Then hand him a LIGHTED Cigarette from beautiful pocket-size "MAGIC CASE." Just touch button. Presto! Out comes LIGHTED cigarette automatically. No batteries or electricity. Everybody wants one. Orders come fast. Profits pile up big.

**15 Day Trial Offer**

Get a Magic Case for 15 Days' Trial at our risk and amazing money-making facts. Write today. State favorite brand of cigarettes.

**MAGIC CASE MFRS., 424 Cozens Ave., Dept. D-370, St. Louis, Mo.**

**Learn to MOUNT BIRDS  
Tan SKINS, Make Up FURS**

**Be a Taxidermist. We teach you at Home.**

Mount Birds, Animals, Pets, common specimens. Save your hunting trophies; decorate home and den. Make genuine KROME LEATHER, too, and make up furs for sparetime profit.

**FREE BOOK** 48 pages—tells all about it.

Hunters, get this wonderful book. It's Now Free. Send postal card Today—

This Minute! State your AGE.

**N. W. School of Taxidermy, Dept. 3374 Omaha, Nebr.**

**BUILD IT YOURSELF**

Can be built by anyone. Is sure impossible. Total cost approximately \$385.00 for all materials. Our large sized blueprints and construction sheets make it a pleasure to build this sturdy designed Trailer. Sleeps four—all conveniences beautifully appointed. Factory job would cost over \$1000—build it yourself and save 75%.

Plans sheet, completely illustrated and detailed for 25¢ stamps or coin.

**THE TRAILER PLAN SHOP, 507-519 North Michigan Avenue, CHICAGO, ILL.**

**OFFERED: \$250 FOR  
MISSING LAST LINE**

If you will turn to page 139A, you will find a most interesting contest, one that you will want to enter just for the fun of it. But everyone who enters gets a worth-while gift and acknowledgment of entry, besides the chance to win one of 58 cash prizes. Be sure to look for the important clues in TUMS advertisement on page 139A.



**DRILL-INDEX** Keep your drills in a DRILL-INDEX.

Works like a card index. A flip of the wrist opens the case. Four sizes. Ask your dealer or write to

**Huet Mfg. Co., Foot Schulte Bldg., St. Paul, Minn.**

**HOME STUDY COURSES**

Home-Study Courses, leading to Degrees in Arts and Sciences: Education; Writing; Psychology; Chemistry; Business and Commerce; Law; Theology; Agriculture; Engineering; also courses in Business Training; Accounting; Advertising; Sales Management; Public Speaking; Radio. Many others. Low Cost; Easy Terms.

**McKinley-Roosevelt University, 4247 Clarendon Ave., Chicago**

**NEW POPULAR MECHANICS  
BOOK CATALOG**

1936 edition "A Billion Ideas" just issued. Thousands of useful books on practical subjects described and illustrated. Will be sent upon receipt of three cents in stamps to cover postage.

Address

**Popular Mechanics Press**

**200 E. Ontario St.**

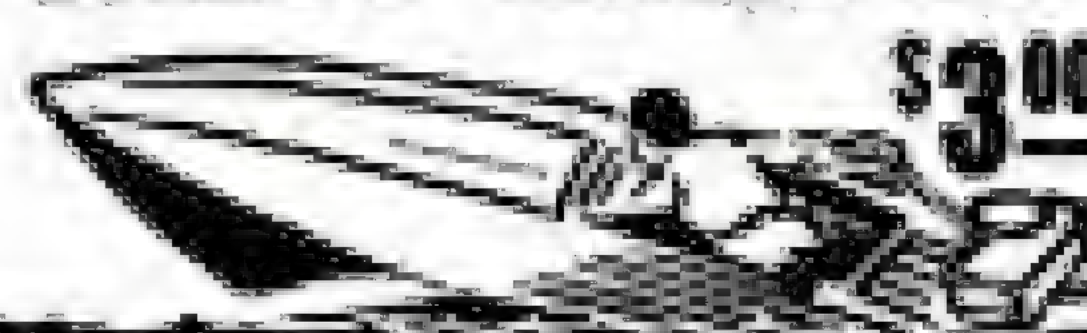
**Chicago**

**BUILD A BOAT at Home**

**YOU CAN  
DO IT AT  
LOW COST**

Just the boat you've always wanted. Build for your own pleasure or to sell. Popular Mechanics Boat Book, New Edition, with 8 added boats shows how. Gives complete plans. Shows materials and methods. Specially prepared for those with limited skill and tools. Most practical book on subject. Order now and pay postman on delivery.

**Popular Mechanics Press, Room 436-C  
200 East Ontario Street, Chicago**





## 60 ART LESSONS

**Become Talented Artist with Big Income**

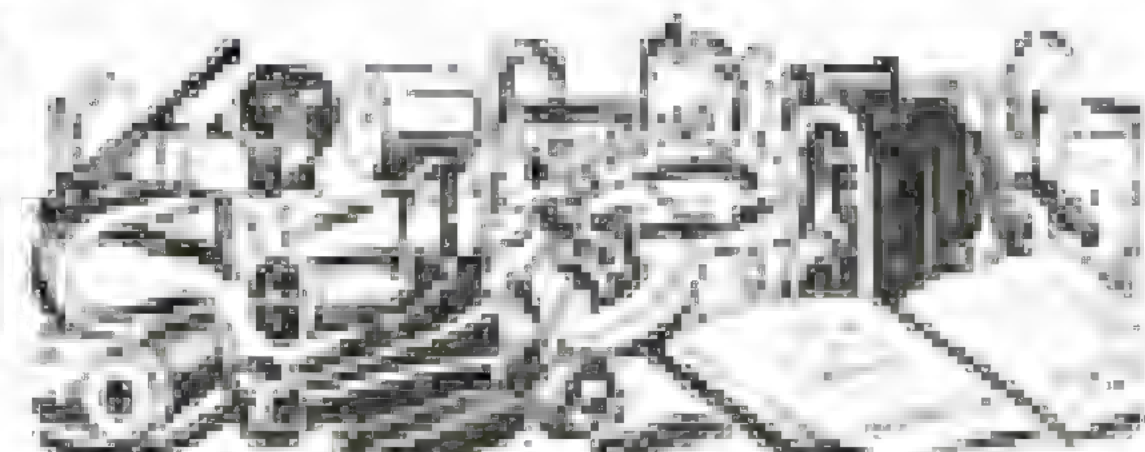
This thorough Course by Alexander Murray, famous Art School Instructor, makes it easy to learn art in spare time. Teaches commercial art, cartooning, lettering, anatomy, perspective, etc., without bother or expense of correspondence. You get all 60 lessons at once—no waiting for next lesson. Over 515 instruction illustrations. 128 pages of drawing paper **FREE**. Send only \$1.95 for Complete Course postpaid—or pay postman plus postage. **MONEY BACK** if not delighted with advertisement. Start now turning your spare time into **MONEY!**

**EDUCATIONAL SUPPLY CO., Dept. A102-D, RACINE, WIS.**

**Only \$1.95 POST PAID COURSE COMPLETE**

## 25 Piece ELECTRICAL EXPERIMENTAL KIT

A. C. 110-volt generator—small D. C. motor—25 pieces genuine commercial apparatus—15 lbs.—50 fascinating experimental broadcast over your own radio—make arc light 4000 ft. range—secret detestophone, listen in on private conversations—generate 110-volt electricity—cheap detector—generate health rays—electro-plate, etc., etc. **F. R. E. K.** with kit, Short Course in Electricity—Lab. Bench Plans and B. Print! Order direct from ad, or send name for Free Experimental Catalog. Send **NOW!**



Original Cost of Parts, \$18.50  
**SPECIAL, only \$3.99**

**ELECTRICAL SALVAGE CO., Box 524-P, LINCOLN, NEBR.**

## STREAMLINE Your Efforts for Better Results—Bigger Pay

Cut down the resistance and friction that keeps you from success. Learn the best, easiest and most practical ways of doing things. Use modern **STREAMLINED** ideas. Cash in with

### SHOP NOTES FOR 1936

Popular Mechanics Shop Notes for 1936 gives you 360 helpful, handy, money-making ideas, short cuts and practical plans. 224 pages of usable information. 793 illustrations. Specially prepared for mechanics, handyman, home workshop fans, farmers—the everyone who uses tools to make things and do things. Order today! Get also, 1935 Shop Notes with 332 different articles. Send 50 cents for either book. Both books sent postpaid for \$1.

### 360 Money-Making and Time-Saving Articles Including:

Air Conditioning Lathes Operation  
Auto Owner Help Tool Kinks  
Electrical Kinks Workshop Hints

World's  
Big  
50c  
Worth



Popular Mechanics Press, Room 436-B, 200 E. Ontario St., Chicago

## Profit from Books

Popular Mechanics Press specializes in supplying books on any subject. Look over this list. Check the books you want, and mail this advertisement as your order blank. Write for information about books on any special subject you may be interested in.

**AIR CONDITIONING SERVICE MANUAL**  
Small Unit Apparatus... \$5.00  
**ARMATURE WINDING**  
and Motor Repair... \$3.00  
**AUTO RACING**  
How to Build Dirt Track Racers... \$1.00  
**AUTO REFINISHING**  
Duo With Spray Gun... \$1.50  
**BRICKLAYING**  
Plain and Fancy... \$1.50  
**CAMPS AND LOG CABINS** (Building)... \$2.00  
**CARBURETORS** (All Makes)  
New, Revised Edition... \$2.50  
**CHEMICAL MAGIC**  
Experiment, Entertain, Mystify... \$1.00  
**DANCE**  
Learn at Home Without Music or a Partner... \$2.00  
**DRAWING**  
Freehand and Perspective... \$1.50  
**DRY CLEANING** (Practical)  
and Dyer... \$3.00  
**ENGINEERS' VESTPOCKET**  
Reference Book... \$1.50  
**FURNITURE REPAIRING**  
Finishing and Decoration... \$3.00  
**HYPNOTISM**  
How to Become an Expert... \$2.00  
**INVENTION, YOUR**  
How to Protect and Merchandise... \$1.50

**LANDSCAPE GARDENING**  
Practical... \$2.50  
**LEATHER MAKING AND HOME TANNING**... \$1.00  
**LOCKSMITHING**  
Revised Edition... \$2.00  
**MONEY MAKING FORMULAS**  
15,000 Practical... \$5.50  
**MUSHROOMS**  
Raise for Market... \$1.75  
**NEON SIGNS**  
Only book on. New... \$3.00  
**PATTERN MAKING**  
Excellent New Book... \$1.50  
**PLASTERING**  
Best Instruction Manual... \$1.25  
**RADIO PHYSICS COURSE**  
New edition. Everything about Radio from A to Z... \$4.00  
**REFRIGERATION SERVICE**  
Manual (All Makes)... \$5.00  
**RUBBER ARTICLES**  
How to Make... \$2.00  
**SHEET METAL**  
Construction Work... \$2.00  
**STAMP COLLECTING**  
Why and How... \$1.50  
**Steam Engineer's License**  
How to Obtain... \$2.00  
**TAXIDERMY, HOME**  
Mount Trophies Profit, Pleasure... \$1.50  
**WROUGHT IRON WORK**  
Practical... \$1.35

**Books sent C. O. D. anywhere in U. S.**

Just check the books you want, and mail the whole advertisement. It is your order blank. When postman hands you books, pay him the price and few cents postage. If you send remittance when ordering please include 10 cents per book extra for postage.

**POPULAR MECHANICS PRESS, P-4, 200 E. Ontario, Chicago**

# WORK FOR THE GOVERNMENT

**START**

**\$1260 to \$2100 a Year Men, Women**

**GET READY IMMEDIATELY**

**Common education usually sufficient  
Influence not needed**

### 40 Hour Postal Week

The Postal department recently went on a 40 hour week (run 44 hours). This is expected to mean many Postal appointments during 1936.



### City Mail Carriers, Post Office Clerks

Post Office Clerks and Carriers get \$1,700 the first year on regular, and automatically increase \$100 a year to \$2,100 with special increase to \$2,300 for Clerks. New 40-hour week means many Post Office Carrier and Clerk Appointments. Men—women, 18 to 45.

### Railway Postal Clerks

Railway Postal Clerks get \$1,900 the first year regular, being paid on the first and fifteenth of each month. (\$79.17 each pay day.) Their pay is automatically increased yearly to \$2,450. Advance may be had to Chief Clerk at \$2,700 a year. (\$112.50 each pay day.) Men 18 to 35.

### Customs Inspector

Salary \$2,100 to start. Men 23 to 45. Work connected with examining baggage and merchandise entering the country from foreign parts, covering boats, trains, roads, automobiles, etc.

### File Clerk

Open to Men—Women 18 to 50. Entrance salary \$1260—\$1440 Year. Appointments as File Clerks and Clerks in the Departments at Washington, D. C., are made from this examination.



### Get Ready Immediately

Those wishing these positions should qualify at once.

### Get Free List of Positions

Fill out the following coupon. Tear it off and mail it today—now, at once.

This investment may result in your getting a big-paid government job.

FRANKLIN INSTITUTE, Dept. H-174, Rochester, N. Y.

Rush to me, entirely free of charge (1) a full description of U. S. Government Jobs; (2) Free copy of illustrated 32-page book, "U. S. Government Positions and How to Get Them," with sample coaching tests; (3) List of U. S. Government Jobs; (4) Tell me what to do to get a U. S. Government Job.

Name .....

Address .....

Use This Coupon Before You Mislay It. Write or Print Plainly

When writing please mention Popular Mechanics



## The Editor's



## MAIL BAG

(Continued from page 34A)

formation on the grainless process, which permits enlargement to amazing, almost unlimited size."—*George A. Wilson, Creston, Nebr.*

### Skilled Boat Carver

"I have been visiting Cape Cod for years and have a fairly good idea of what a good fishing boat looks like. Manuel Souza, a Portugese fisherman, carves the best models of fishing boats that I have ever seen. They are carved from solid wood with a



pocketknife and range from one to five or six feet from stem to stern. A photo of one of his models accompanies this letter."—*H. F. Cunningham, Provincetown, Mass.*

### Two Real "Old Timers"

"I read with interest the record of Carl Schlaefke as a subscriber to your magazine. I can go him one better. My Popular Mechanics library dates from March, 1906."—*Lowry Sexton, The Dalles, Ore.*

"I have taken your magazine since 1903 and must say it is the most interesting and useful one we ever have had in our home. We used to save them, but they became so many that now we cut out the pages of items we wish to keep and put them in looseleaf covers."—*George G. Barons, Vancouver, B. C.*

### There's a Trick in It



"Enclosed is a trick photo of a dirt track car model which I built in spare time. The double picture is the result of an article on 'Split Pictures' which ran in Popular Mechanics a year or so ago. The background is 'very much painted'."—*Edward Welch, Chicago, Ill.*

### Inventions Fan

"I have been taking Popular Mechanics for seven years and each month I look forward to its coming. I particularly like the way you treat inventions."—*Robert Belsky, Dubuque, Iowa.*

### Teaches Wood Carving

"Enclosed find a picture of myself working in my studio and also a copy of my book, 'Modern Wood Sculpture,' which I use in teaching wood carving."—*Raymond C. Lee, Centerville, Iowa.*





# Popular Copyrights Are Abandoned

## 2,900,000 Books Left to Sell at 20 BOOKS for \$1

4 Age of Reason, Paine  
19 Nietzsche's Philosophy  
20 Let's Laugh  
25 Rhyming Dictionary  
29 Aristotle's Philosophy  
42 Origin of Human Race  
52 Insects and Men; Instinct vs. Reason, Darrow  
56 Dictionary of U. S. Slang  
82 Faults in Writing English  
83 Evolution of Marriage  
91 Manhood; Facts of Life  
98 How to Love, Clement Wood  
109 Facts About Classics  
110 History of World War  
150 Quack Facts About Lost Civilizations

160 English As She Is Spoke  
192 Book of Synonyms  
217 Puzzle of Personality  
228 Plain Talks with Husbands and Wives, Ellis  
267 Do We Need Religion?  
326 How to Write Short Stories  
364 How to Argue Logically  
367 How to Improve Your Conversation

402 Facts About Music  
411 Facts About Phrenology  
414 Art of Being Happy  
422 Jokes About Yankees  
439 12 Years in a Monastery  
452 Dict. of Scientific Terms  
467 Facts of Evolution  
473 Lives of Chorus Girls  
475 How to Develop Sense of Humor

479 How N. Y. Girls Live  
491 Psychology for Beginners  
501 How to Tie Knots  
518 How to Make Candy  
530 What Women Beyond 40 Should Know  
550 Hints on Etiquette  
620 Handbook of Legal Forms  
639 4,000 Essential Words  
644 Women Who Have Lived for Love

653 What Every Boy Should Know  
654 What Young Men Should Know  
655 What Young Women Should Know  
656 What Married Men Should Know  
657 What Married Women Should Know

658 Toasts for All Occasions  
679 Chemistry for Beginners  
681 Spelling Self Taught  
682 Grammar Self Taught  
683 Punctuation Self Taught  
687 U. S. Constitution  
696 How to Pronounce Names  
697 Words Often Mispronounced  
703 Physiology Self Taught  
704 Facts About Palmistry  
715 Auction Bridge  
726 Facts About Venereal Diseases

727 Psychology of Affection  
731 Mental Differences of Men and Women  
734 Book of Useful Phrases  
759 How to Conquer Stupidity  
773 Good Habits and How to Form Them  
782 Psycho-Analysis: Mind and Body  
815 Dictionary of Familiar Quotations

816 Shakespearean Quotations  
817 Her Burning Secret  
819 Book of Strange Murders  
820 Jokes About Married Life  
821 How to Improve Vocabulary  
822 Rhetoric Self Taught  
823 English Composition  
835 Handbook of Useful Tables  
842 Book of Best Jokes  
845 Facts to Know About Fortune Telling

846 Womanhood: Facts of Life  
847 How to Play Card Games  
850 Bad Habits and How to Break Them  
855 How to Write Letters  
856 Arithmetic Self Taught. 1  
857 Arithmetic Self Taught. 2  
862 German Self Taught  
872 Parliamentary Law  
876 Curiosities of Mathematics  
889 Jokes About Kissing  
891 Your Talent and How to Develop It  
893 500 Riddles  
895 Astronomy for Beginners  
896 Wages of Sin  
903 All About Syphilis  
930 Mark Twain's Idle Excursion

TAKE your pick of the books listed on this page at the rate of 20 books for \$1. Every one guaranteed a popular copyright unobtainable elsewhere. Exorbitant royalties and fees forced us to stop printing these. 2,900,000 books left must be sold! Choose yours now! Last chance! Order today! Same-day service!

Add 1c per book for postage

Single Copies 25 Cents

964 How to Be Happy Though Married  
972 Book of Popular Jokes  
975 Cleopatra and Her Loves  
984 Harmony Self Taught  
986 How to Talk and Debate  
988 The Art of Courtship  
995 How to Play the Piano  
999 Latin Self Taught  
1003 How to Think Logically  
1004 How to Save Money  
1008 Origin of Religion  
1009 Typewriting Self Taught  
1010 Amateur Magic Tricks  
1011 French-English Dictionary  
1013 Best Irish Jokes  
1018 Humorous Limericks  
1020 Why I Am an Infidel, Luther Burbank

1021 Italian Self Taught  
1030 World's Great Religions  
1040 How to Sing  
1065 Lives of U. S. Presidents  
1069 Conquest of Fear  
1070 How to Fight Nervous Troubles  
1074 Handbook of Commercial Law  
1082 Best Jewish Jokes  
1084 Did Jesus Ever Live?  
1092 Simple Beauty Hints  
1097 Memory: How to Use It  
1103 Puzzles and Brain Teasers  
1105 Spanish-English Dictionary  
1109 Spanish Self Taught  
1126 Eating for Health  
1139 Photography Self Taught  
1174 How to Write Business Letters

1176 A Mad Love  
1184 Best Scotch Jokes  
1204 Dict. of Musical Terms  
1207 French Self Taught  
1209 Charming Hostess: Entertainment Guide  
1210 Mathematical Oddities  
1216 Italian-English Dictionary  
1221 Facts About Will Power  
1225 How to Avoid Marital Discord  
1228 Best Jokes About Drunks  
1238 Beginning Married Life Right  
1239 Games for Grown-ups  
1241 Outline of U. S. History  
1242 Care of Skin and Hair  
1247 Psychology of Love and Hate  
1249 Best Jokes About Lovers  
1278 Ventriloquism Self Taught  
1285 Gamblers' Tricks Exposed  
1292 Best Short Stories of 1928  
1311 Real Aims of Catholicism  
1322 Confessions of a Modern Woman

1329 Facing Life Fearlessly  
1330 Facts About Digestion  
1339 Crooked Schemes Exposed  
1340 How to Get a Job  
1341 Unusual Menus  
1342 Typical Love Problems  
1351 How to Get Ahead  
1354 Book of Stimles  
1357 Facts About Law  
1361 Who Killed Jesus?  
1362 Law for Women  
1365 Build Your Vocabulary  
1382 Is Our Civilization Over-Sexed?  
1389 Tobacco Habit  
1392 Confessions of a Gold Digger  
1430 Shorthand Self Taught  
1434 How to Think Clearly  
1439 Intelligence: How to Test  
1440 Can Man Know God?  
1445 Wild Women of Broadway  
1448 Character Reading from Faces  
1471 How to Become Mentally Superior  
1475 Best Jokes  
1476 What You Should Know About Your Sensations  
1477 How Glands Affect Personality  
1491 Power of Women  
1500 Why I am an Agnostic  
1501 Mussolini and the Pope  
1503 Effective English  
1504 Overcoming Self-Consciousness  
1505 Facts About Africa  
1508 Facts About Poisons  
1514 Inventions of Edison  
1524 Famous Eccentric Americans  
1532 Don Quixote  
1533 Famous Infant Prodigies  
1535 How to Throw a Party  
1536 Facing Death Fearlessly  
1540 How to Be Happy  
1542 Who Started World War?  
1543 Is War Inevitable?  
1548 Chinese Cook Book  
1553 Exercises for Nervousness

1554 Beneficial Heart Exercises  
1555 Rules of Success  
1561 French Revolution  
1562 How to Live Long  
1581 Environment vs. Heredity  
1583 Facts About Texas  
1585 From Sin to Psychiatry  
1589 Facing Life Realistically  
1591 Is Hollywood Wicked?  
1592 History of Gambling  
1595 Facts About the Calendar  
1607 Einstein's New Theories  
1620 Merry Tales  
1630 How to Play Stud Poker  
1658 Handbook of Swindling  
1683 Life at U. S. Naval Academy  
1686 Unemployment Insurance  
1687 Facts About Banking  
1688 100 Cocktails  
1699 The Socialist Goal  
1710 Magic of Numbers  
1712 Great Dates in History  
1723 Career of Al Capone  
1725 Story of Tammany Hall  
1726 How to Think  
1728 Care of the Teeth  
1729 Technocracy Explained  
1735 Worldly Wisdom  
1738 How to Win Prize Contests  
1739 How to Build Personality  
1740 True Prison Escapes  
1742 Mental Hygiene  
1743 Facts About Sleep  
1744 Abnormal Psychology  
1745 Story of Cancer  
1746 Mediums' Tricks Exposed  
1747 Games of Solitaire  
1748 Scientific Crime Detection  
1749 How to Play Backgammon  
1751 Methods of Criminals  
1752 How to Be Detective  
1753 Why Many Women Are Unattractive  
1754 How to Read Finger Prints  
1755 How to Be Fur Trapper  
1756 Simplified Cook Book

1754 How to Read Finger Prints  
1755 How to Be Fur Trapper  
1756 Simplified Cook Book

### How to Order:

Just list titles desired by number. Order at least 20 books and enclose money order, check or currency at rate of 20 books for \$1—minimum order \$1. Add 1c per book for carriage charges. If you order less than 20 books remit at rate of 25c per book. 5c offer applies only when remittance accompanies order. Save real money by sending cash with order. (No C. O. D. orders.) Canada or foreign countries must remit by international postal money order at rate of 7c. postpaid.

### Use This Simple Order Form for Popular Copyrights

HALDEMAN-JULIUS PUBLICATIONS,  
Dept. X-30, Girard, Kansas.

Enclosed please find \$..... which is payment at the rate of 20 books for \$1 for the following popular copyrights which I have listed by number on the lines below. (Add 1c per book for postage. Add 10c to personal checks. If order is less than \$1 remit at rate of 25c per book.)

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

**Haldeman-Julius Publications**  
Dept. X-30 Girard, Kansas

When writing to advertisers please mention Popular Mechanics





© 1936, R. J. Reynolds Tob. Co.

## WHAT TO EXPECT WHEN YOU TRY PRINCE ALBERT



It was Prince Albert that popularized the improved cut — "crimp cut." And Prince Albert that brought forward the special P. A. process that banishes all "bite." It is made from choicest tobaccos and recognized as the world's leading smoking tobacco. So expect mildness from P. A. and a soothing mellowness. Try Prince Albert in your pipe. It's great for roll-your-own cigarettes too.



### OUR OFFER TO PIPE SMOKERS

*"You must be pleased"*

Smoke 20 fragrant pipefuls of Prince Albert. If you don't find it the mellowest, tastiest pipe tobacco you ever smoked, return the pocket tin with the rest of the tobacco in it to us at any time within a month from this date, and we will refund full purchase price, plus postage. (Signed)

R. J. Reynolds Tobacco Co., Winston-Salem, N. C.

**PRINCE ALBERT** THE NATIONAL JOY SMOKE!

**50** pipefuls of fragrant tobacco in every 2-oz. tin of Prince Albert.

When writing to advertisers please mention *Popular Mechanics*



# Popular Mechanics Magazine

REGISTERED IN U. S. PATENT OFFICE AND CANADA

WRITTEN SO YOU CAN UNDERSTAND IT

Vol. 65

APRIL, 1936

No. 4

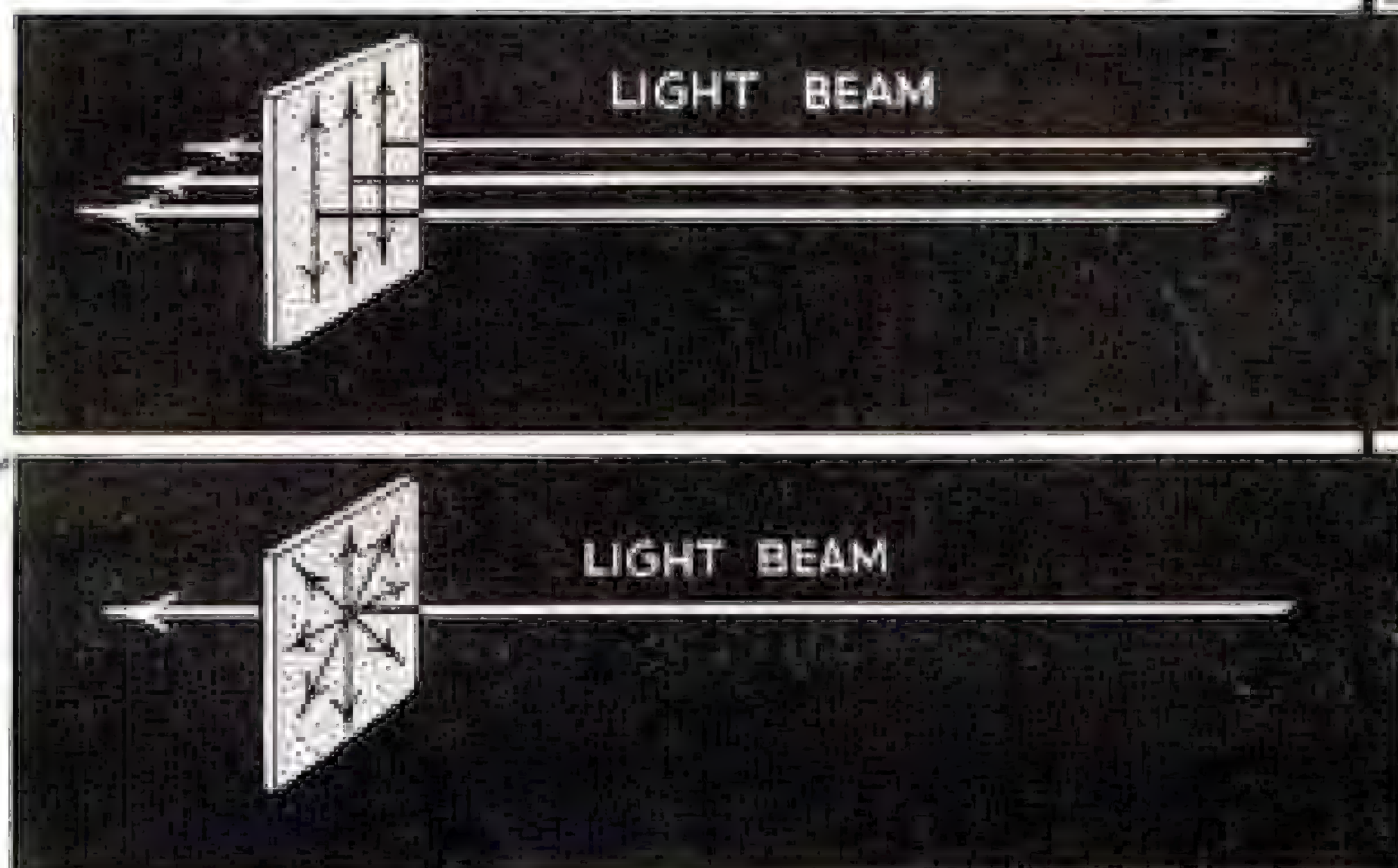
## One-Way GLASS Stops GLARE

SOUGHT ever since the invention of the automobile, glareless headlights have at last been shown in actual operation in a demonstration of a unique glass which polarizes light and is known as Polaroid.

A pair of blinding headlights was set up at each end of the demonstration room. When these were viewed through a Polaroid windshield, these brilliant lights seemed almost out, although objects between the two sets of lights were brilliantly illuminated.

Polaroid looks like clear, colorless glass

Below, Polaroid glass, top picture, "combs out" tangled light waves so they occur in one plane or parallel planes, but ordinary glass, at bottom, does not have this effect



Top, how Polaroid windshield cuts glare of Polaroid headlight. Below, how two pieces of glass, whose polarizing planes are at right angles to each other, can be made opaque

481

Land. Wheelwright Laboratories  
168 Hartmouth St.

The Polaroid Corp. 285 Columbia Ave  
730 Main St. Boston Mass

(ed no Edward Land)

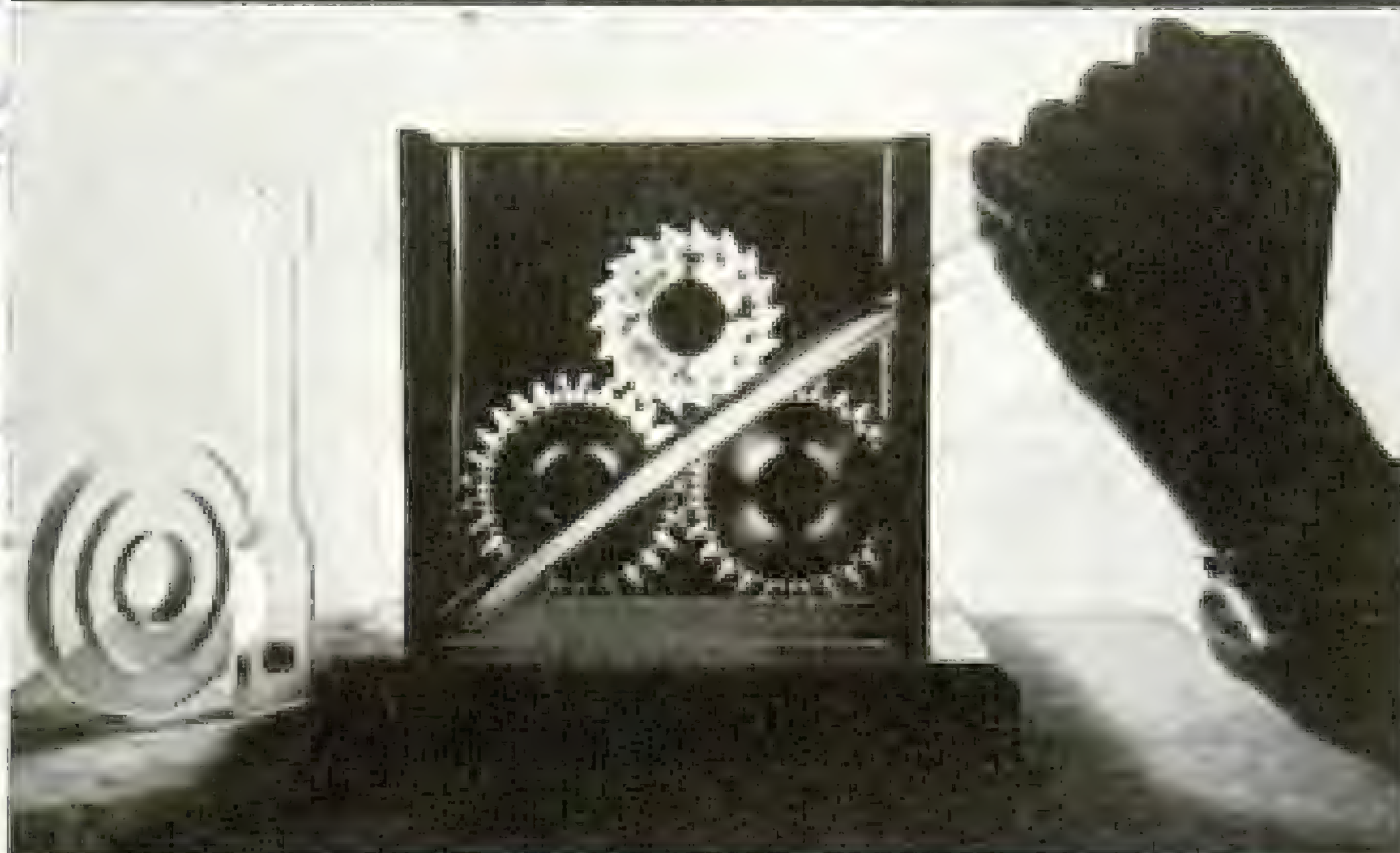
F168

see March. 1936 - 412





Besides removing the glare from automobile headlights, this glass makes lifelike three-dimensional movies available for commercial projection, gives beauty specialists and photographers a new penetrating light for viewing the skin, provides engineers with a powerful means of spotting defects in the design of new bridges, aircraft, and other structures long before they are built, and gives science a new tool for prying out secrets in many branches of knowledge.



About ten years ago a boy in his teens, Edwin H. Land, was attracted to the astonishing properties of polarized light. It gave interesting optical effects, which had been observed for many years before his time. But industry and the public could not use polarized light until some practical, cheap, and simple method for producing it could be found.



Top, using polarized light to see below the outer skin. Center, using polarized light to reveal internal stress and strain in machine parts. Bottom, Polaroid analysis of stress and strain in spread footing used in building construction

Land went to Harvard, but his pet idea bothered him so much that he finally took a leave of absence and induced one of his teachers, George W. Wheelwright, to join him. After years of secret work, he developed "Polaroid glass" which is really not a glass but innumerable artificial crystals suspended in a cellulose matrix a few thousandths of an inch in thickness. These ultra-microscopic crystals really make a sheet of glass act like a single large mineral crystal.

and light that has passed through Polaroid looks like ordinary light. The light rays, however, are actually combed out or polarized so that all the vibrations of the rays occur in one plane. Thus light can now be controlled on a scale which has never been known before.

Now to explain the theory of polarization, Land was forced to abandon the old theory that light waves travel in longitudinal lines, like sound waves. According to Land, light waves move longitudinally in the direction of the beam, but the "elements of the wave" move at right angles. Light, therefore, may be said to consist of transverse waves. For instance, light from the sun

*Handwritten notes:* ... 911



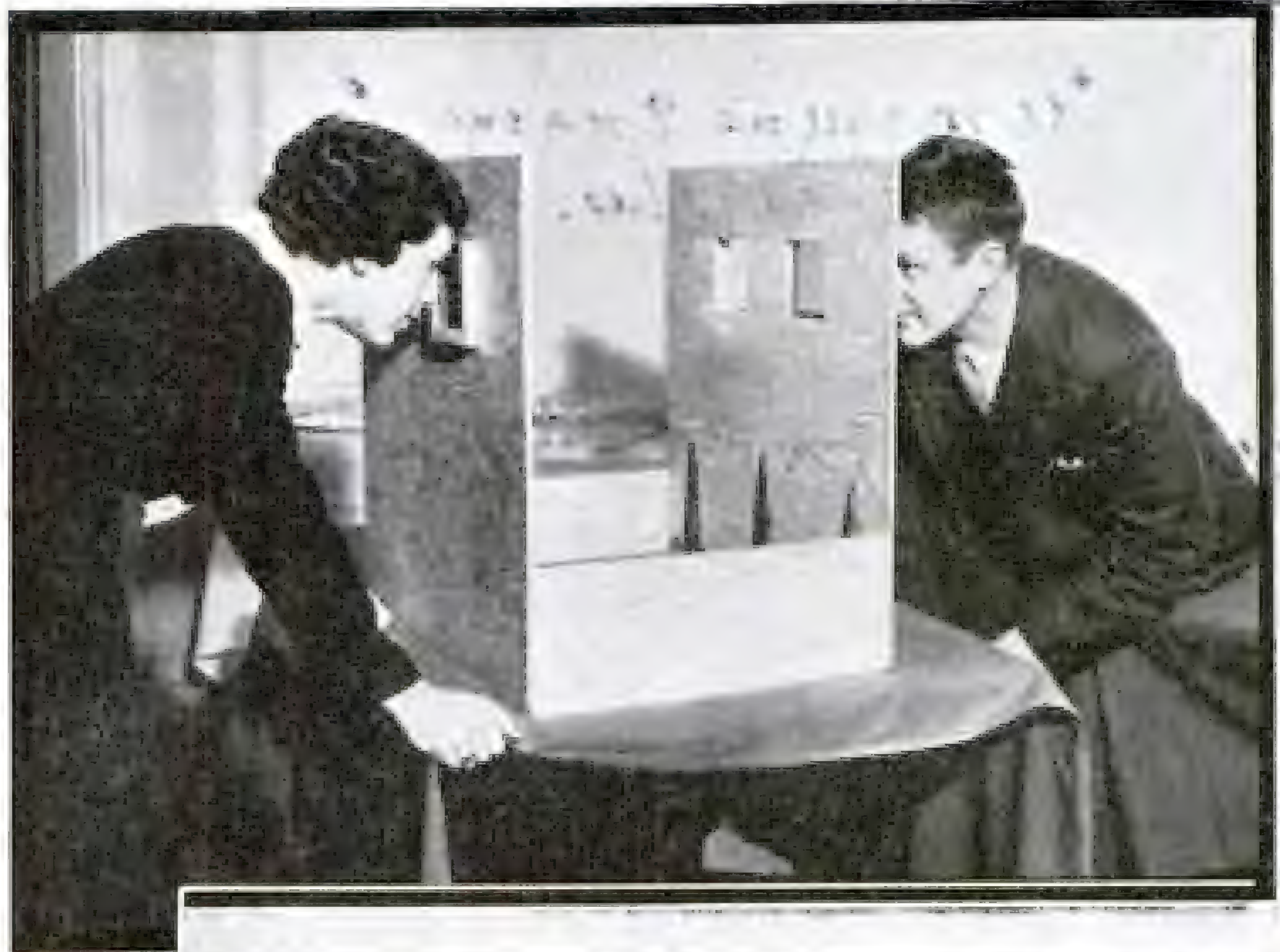
vibrates in all possible planes at right angles to the direction of the beam. Such light is unpolarized, or "tangled."

The new Polaroid glass contains a thousand billion crystals per square inch. These crystals lie parallel and in one direction, so that when ordinary light waves pass through Polaroid they are "combed" out and untangled. Polarized light means that wave motions are in one plane, or in parallel planes.

If properly placed, two sheets of Polaroid glass can be made opaque to the eye. This opens a possibility that Polaroid might be used in apartment house courtyards. You would be able to see outside your own window, but you could not see through your neighbor's window, because the two glass sheets cancel each other. The disadvantage, however, is that Polaroid cuts down illumination; and, besides, your neighbor can see through your glass merely by opening his own window.

Another possible use of Polaroid is in theatrical and building illumination. If you project polarized light from behind a screen of transparent or semi-transparent substance, like Cellophane, you refract the light on this colorless substance and obtain a veritable fairyland of colors in soft, pleasing shades. By rotating your light source, these colors can be made to change continuously through the whole color spectrum. A mobile color system like this will find many applications in stage presentations, in colored-movie photography, and in building illumination.

For seeing pictures without glare, it is proposed to use Polaroid illumination in museums. In this way, the difficulty of standing off and seeing an oil painting from the right angle is overcome at once.



Top, one-way glass permits you to see out your window, but not through one across the way. Below, picture in center was taken in natural lighting, and one at bottom by Polaroid lighting. Note the absence of glare in lower one

Polaroid lighting makes a canvas glareless from all angles, and it affords great assistance to photographers, as well as to lovers of fine art.

A Polaroid screen erected between two people enables one to see beneath the

(Continued to page 154A)



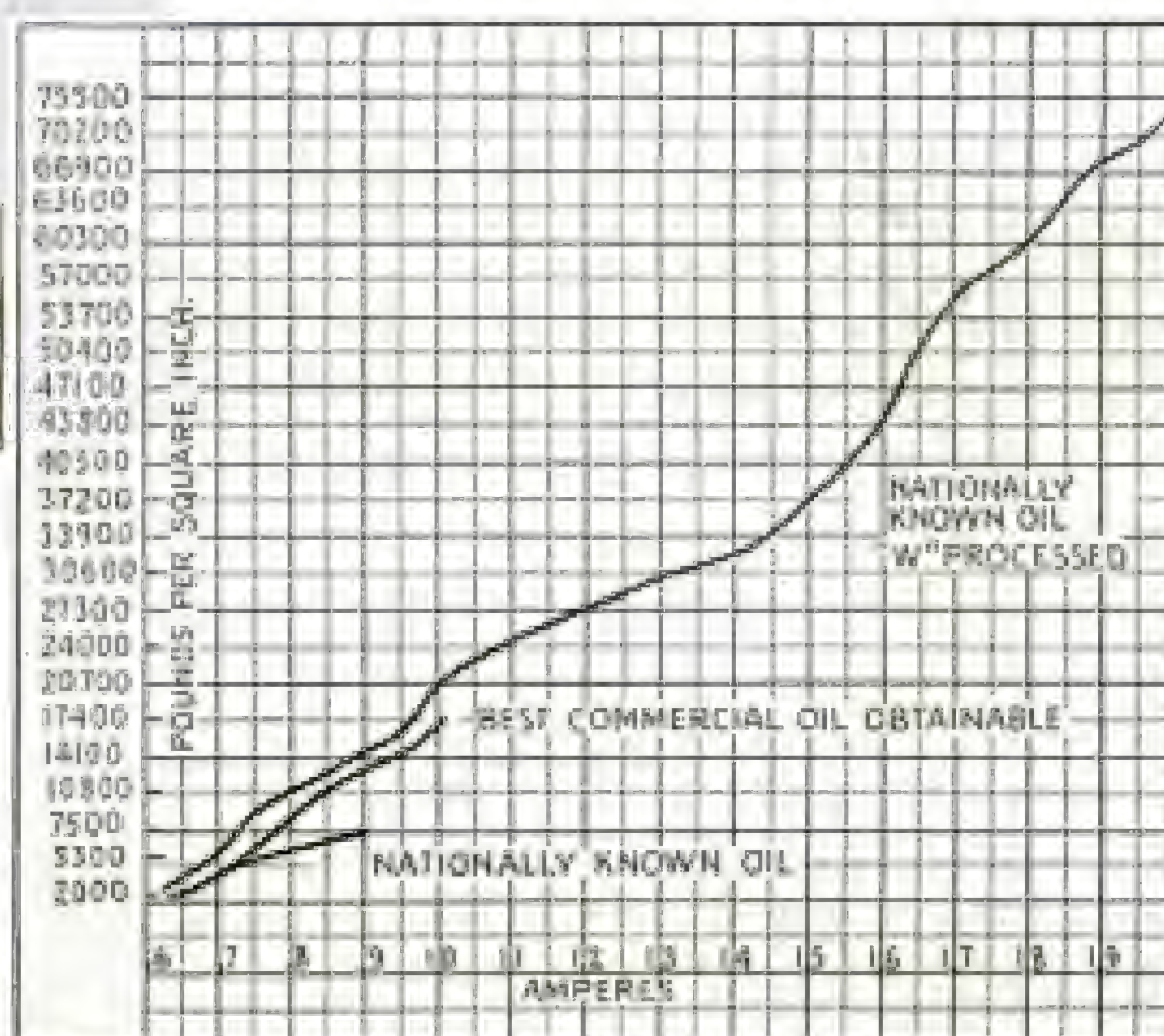
Cont. John R. West  
Asst. & Vice President

## Lubricant Clings to Metal and Reduces Wear

Common's Engine Co.  
Columbus! And



*Left, one of the tests in which electronic lubricant was found highly efficient. Below, graph shows result of the tests, with the processed oil withstanding several times the load limit of untreated lubricants.*



Development of a process which causes lubricants to adhere to metal surfaces when they are warm, when a scraping, wiping or washing action is present or when heavy pressure is applied has been announced. This adherence is directly contrary to the action of untreated lubricants. The process is said to introduce an electronic action, meaning that a lubricant so treated contains a number of infinitely small electronic particles, each carrying an electrical charge having an affinity for metallic surfaces and therefore is attracted and firmly bound to the surface to which the lubricant is applied. Use of processed lubricants, the developers claim, will result in greatly increased life and efficiency in the machine and a corresponding reduction in cost of operation and maintenance. It is considered probable that the new lubricants will make possible more economic design of all forms of machinery requiring lubrication because the size of bearings and journals in many instances may be reduced appreciably. The process does not change conventional properties of the lubricants, save to improve high and low temperature characteristics. One instance where treated oil would prove invaluable is in the automobile engine. Started in winter, the engine receives little, if any, lubrication until the oil warms up. The treated oil, in contrast, would remain on the metal surfaces, even after standing for long periods, and lubrication would begin the moment a single part of the motor moved.

## Test Plane Noses over Safely with Protective Cradle

To enable test pilots at Wright Field, Dayton, O., to nose over an ~~army plane~~ deliberately in trial flights, air corps officials use a special cradle of metal tubing to protect the front of the ship. When the tail of the plane is tilted up, it somersaults smoothly on its cradle. The army flyers are testing new cabin designs required by increasing speed of combat planes. One cabin has an adjustable seat which lets



**Metal "cage" around nose of plane allows pilot to somersault on field in testing new cabin designs**

Cmt. Charles J. Turner,  
Hayton Security News  
Hayton Co.



Cooley Electric

POPULAR MECHANICS

pilots raise or lower themselves eight inches, thus allowing a lower cabin and cleaner streamlining. The pilot is protected by sponge rubber padding, and a heavy beam overhead reinforces the cabin.

**Pass-Around Electric Lighter**  
**Has Glowing Tip**



Handy for lighting cigarette, pipe or cigar, the latest electric lighter is flameless. It consists of two parts, the base to which an electric cord is attached for plugging into alternating or direct current sockets and the pass-around tip which is heated by pressing it into the base. The tip holds heat long enough to light several cigarettes.

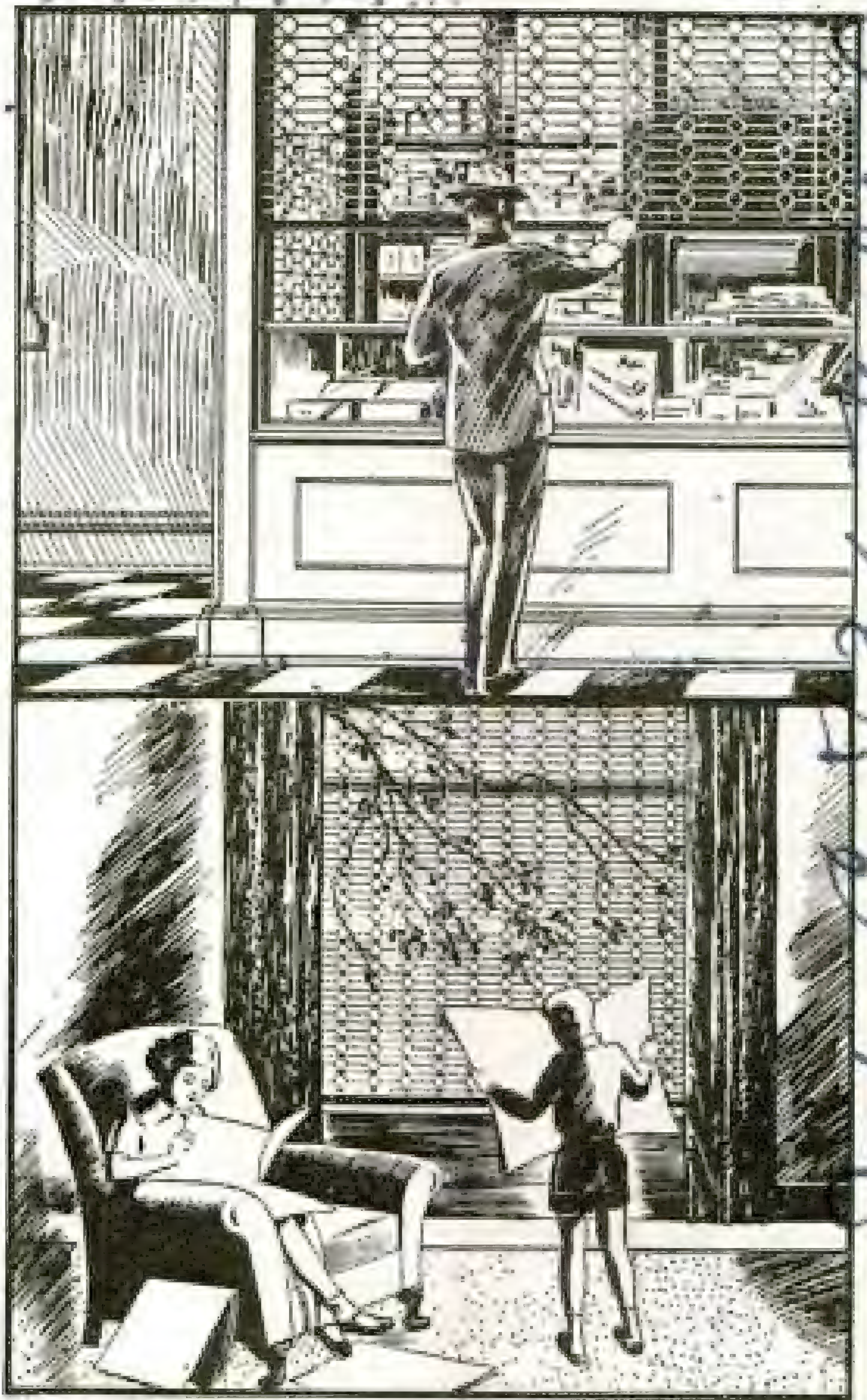
**Smoke Bomb Fired above Fog**  
**Shows Planes Way to Port**

Fog, the dread of aviators, is gradually being beaten. At Croydon airdrome, in England a signaling mortar has been installed to throw smoke projectiles up through the mantle of fog whenever airplanes approach. The bomb is fired 1,000 feet high, where it explodes and shows incoming pilots the location of the field.



Firing smoke bomb from mortar at Croydon airdrome as signal to pilots flying above fog blanket

**Rolling Metal Grille Guards**  
**Windows and Doors**



Top, rolling down grille to protect cigarstand. Bottom, grille in window of home

Protection against trespasser, burglar and kidnaper, a metal grille for window, door or passageway is available. When not in use, it coils on a roller above the lintel, out of the way and unnoticed. It can be lowered quickly and locked. In operation, the grille travels in steel guides on either side of the opening. Manual or automatic operation is possible. If desired, the grille can be connected for use with an electric motor and push button or a photoelectric cell or a sensitive mat. It is made of steel, stainless steel, bronze, or aluminum, its round metal bars being joined by pressed links of octagonal shape. For schools, nurseries, store entrances, gateways, residences, elevator shafts, vaults, compartments and the like, the grille provides a safe barrier without sacrifice of air, light or vision.

Cooley Electric Furnace Co

1411 E. 20th St. Indianapolis

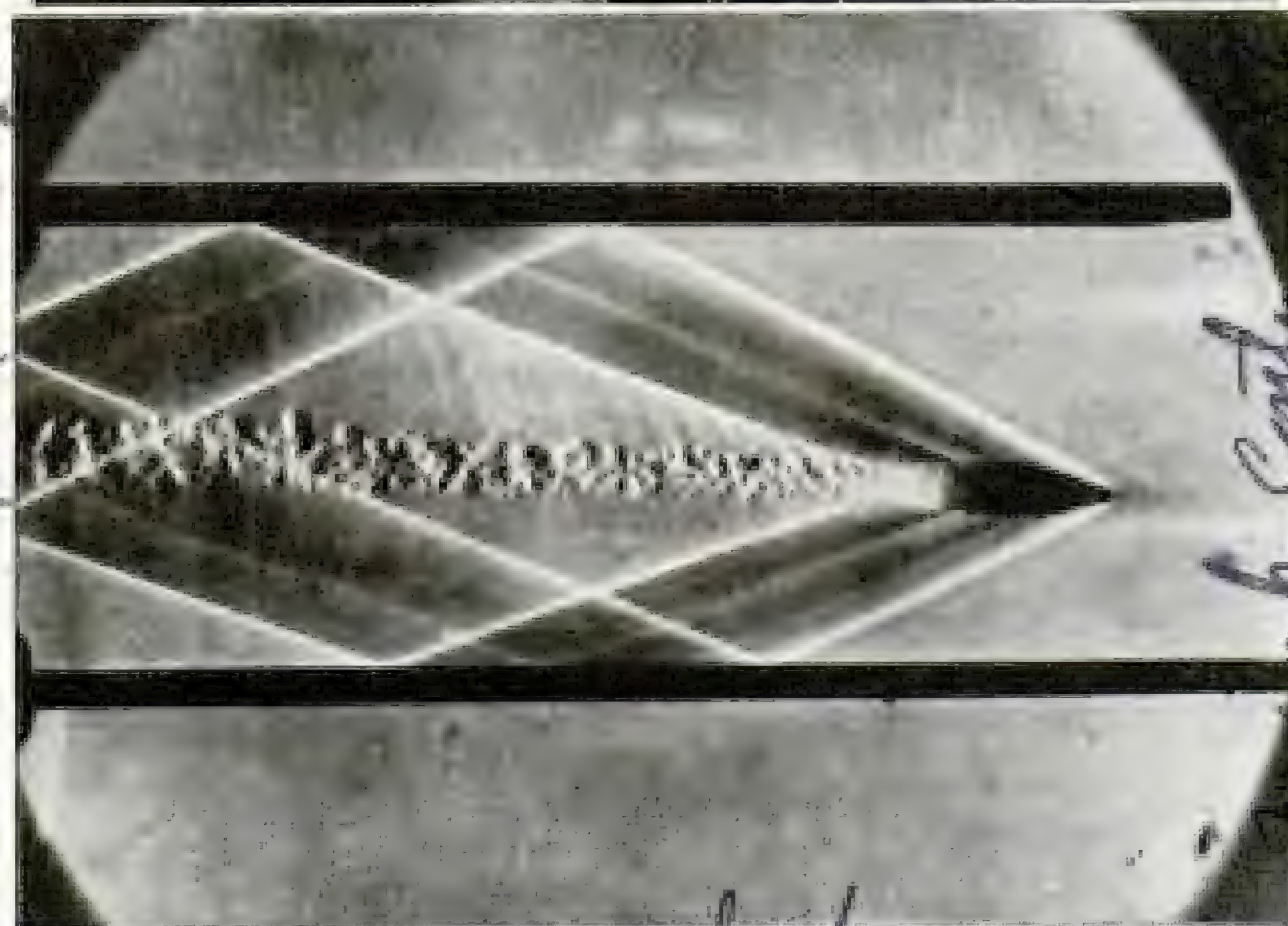
36 Field Columbian. Chicago

Winnear



# Photographs of Sound Waves

Show Their Path of Travel



Top, photographs of sound waves produced by two spark gaps.  
Below, waves emanating from a bullet

Many of the theories concerning the action of sound waves have been confirmed by the eye of the camera. Photographs of sound waves in motion are obtained by a very technical process known as streak photography which was discovered more than seventy years ago by the eminent physicist, Toepler. However, it has been in recent years only that the method has been applied practically in the realm of acoustics, ballistics, flow-physics and heating technique. One picture shows the waves produced by a bullet traveling between two parallel plates. Parting from the nose of the projectile are sound waves and from the rear are tail waves, all reflecting against the plate walls like light

rays against a mirror. The stippled effect behind the bullet is produced by waves from the wake, the vacuum. The other photograph shows sound waves produced by two spark gaps. These waves are similar to those produced by a pebble dropped into quiet water and can be seen to be spreading evenly and virtually independently of each other.

## Certificate of Brake Test Made Automatically by Small Recorder

Certificates showing the condition of the brakes are stamped by an automatic tester each time the car is brought to a stop in state and city tests. Weighing only fourteen pounds, the device makes two readings, one on the certificate inserted in the machine, and the other on a scale on top. The test is made with the machine clamped on the left running board. While the car may be running at any speed from five to thirty miles per hour when the brake is applied, the pointer and the certificate will record the stopping distance exactly as if the car had been traveling twenty miles an hour. The stamping on the certificate cannot be erased or altered. The tester may be used inside the car in inclement weather, provided it is held firmly on the floor while the test is being made.



Removing brake certificate from machine

Bendix Products Corp., Bendix Sales and A. R.





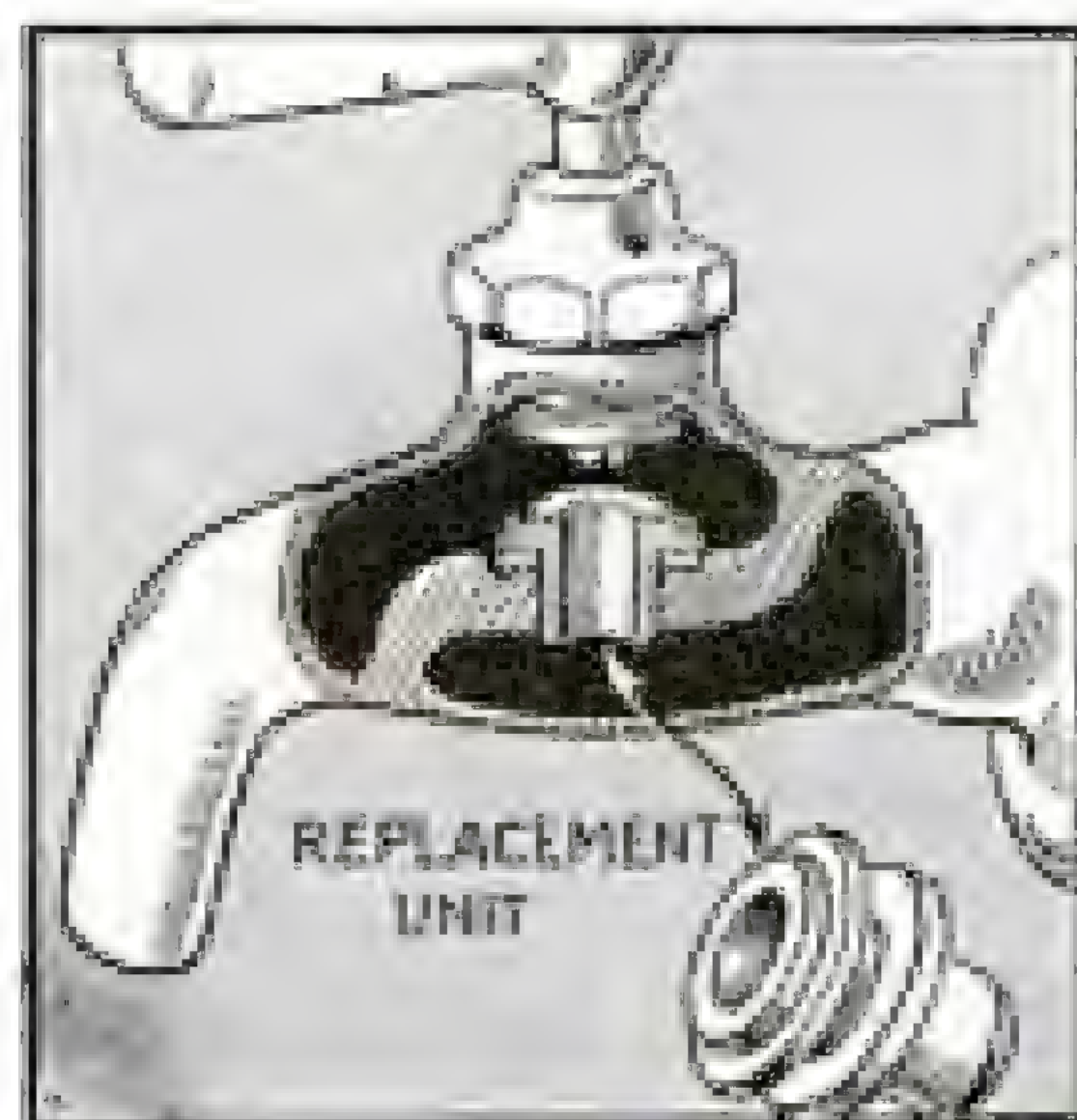
**Top, one of Germany's "pocket battleships," a tiny cruiser with twin 550-horsepower gasoline motors. Left, another of the "mosquito fleet," secretly armed, doing forty miles an hour**

for the German navy in yards at Lemwerder, with a top speed of forty miles an hour. Its armament is a navy secret. These tiny, amazingly fast war boats can be formidable in attack against larger battleships and transports, and their mobility helps protect them.

"Pocket battleships" are taking the place of the great dreadnaughts of Germany's wartime fleet, and a veritable "mosquito fleet" of tiny armed ships is understood to be growing in German shipyards. These torpedo boats, sloops, cutters and even midget cruisers are too small to be governed by treaty restrictions yet are well protected by steel armor, powered by gasoline engines and reputedly strongly armed, representing the best of modern navy engineering in "pocket" size. A German shipbuilder produced for Finland recently a dwarf protected cruiser with two 550-horsepower gasoline motors capable of twenty-five miles an hour. One of the boats illustrated is a speed cruiser built

## Worn Faucet Seat Replaced by Unit Easily Installed

Home owners can repair worn faucet seats by replacing them with a new unit at less expense than installing a new faucet. The unit is inserted in the throat of the old seat with a lead pencil, presenting a new seat to the valve stem washer. A lead washer against the worn seat makes the joint watertight.



joint water right.  
Pink Specialty Co  
189 / E. 10th St. M



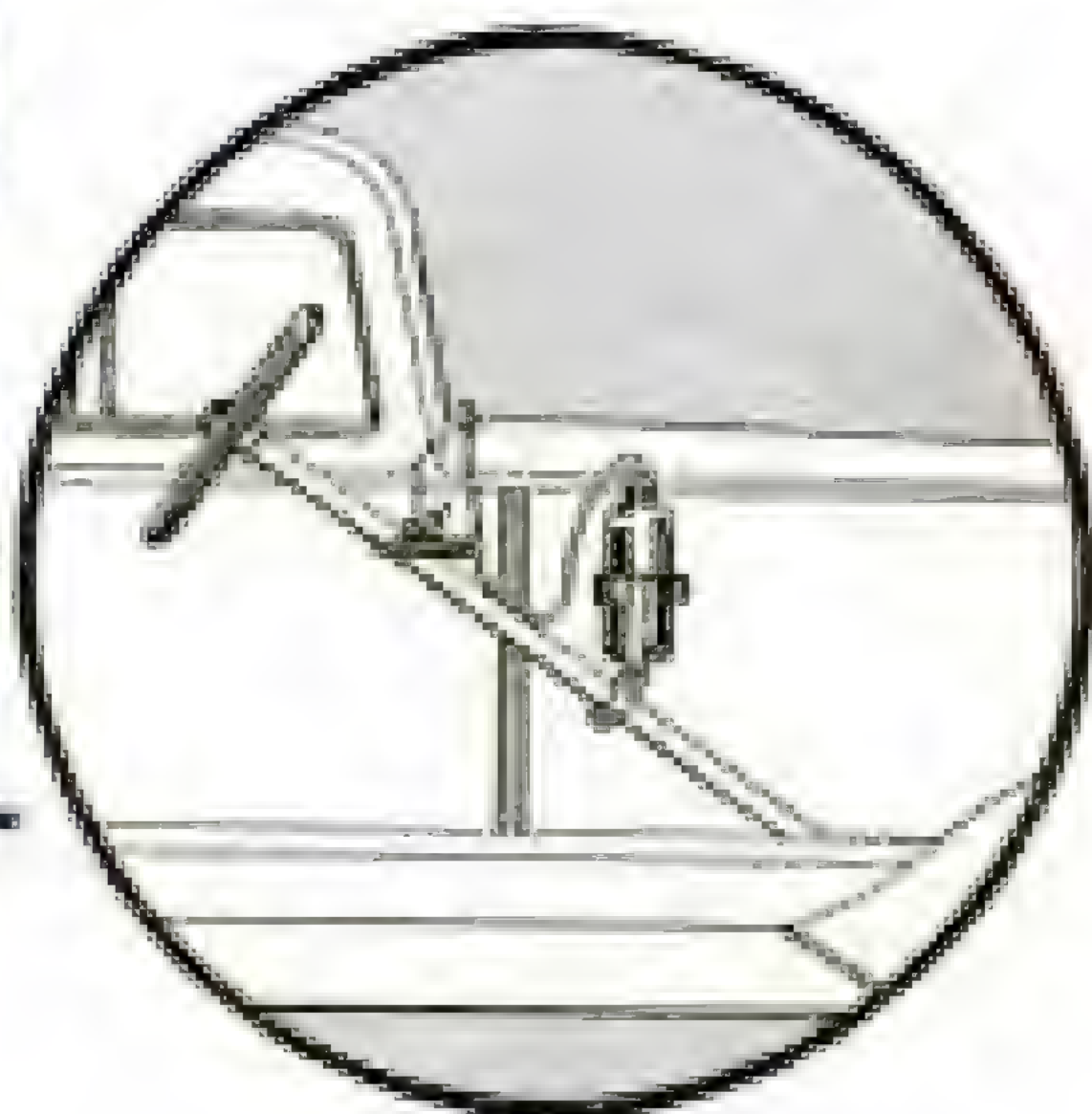
## Earth's Lightest Solids Made by Separating Atomic Twins



Splitting up twin atoms is the business of this apparatus in a Swarthmore, Pa., scientific research laboratory

In the Bartold Research Laboratory at Swarthmore, Pa., scientists are experimenting with an electric machine which produces the world's lightest solids. The feat is achieved by a newly developed "detector" which separates twin atoms.

## F149 Spray Gun to Clean Windshield Is Operated from Dashboard



Windshields can be kept clean in any weather—frosty days, muddy days, dusty days—by installing a spray cleaner that is operated by hand from the dashboard. The

cleaning fluid, supplied with the unit, is mounted in its container on the steering post beneath the hood, and the pressure

gun on the instrument panel sends a stream from the nozzle at the base of the windshield. This cuts the grime, frost, mud, and insects from the glass and lets the wiper clean it efficiently.

## F174 Pile Driver Is Operated by Explosion Cylinder

Instead of dropping a weight from a high tower, the latest pile driver in Germany has an explosion cylinder that bombards the pile with a heavy piston. When the piston rises to the top, expanding gases drive it down with great force. It weighs 1,100 pounds, and the recoil from each explosion lifts it two feet. Two men can operate the pile driver.

## Carving Swordfish Blades Is Seaside Hobby

Joseph Agna of Provincetown, Mass., makes a hobby of transforming the "blades" of swordfish into ornaments. He scrapes and polishes the sword, paints designs on it and uses carved wooden figures for handles. One of his swords, decorated with a sketch of navy vessels, was sent to the White House as a gift to President Roosevelt.



This ornamental sword, polished, painted, carved and given a wooden handle, was once a real swordfish

Ant. J. C. Johnson  
6 Prindle Alden

Weston Products Inc.  
1016 Baltimore Ave.  
Kansas City, Mo.

Helmut, A. Is  
Ernst, Am. Reichel  
Germany

is a very good

with a

Provincetown, Mass.

road.

10-15-10 3/1981



# From the RAINBOW to CONCRETE

289

STAIRCASE of "Gingerbread House" at Hamburg, N. J. Delighted children don't stop to think that the figures are of cast concrete.

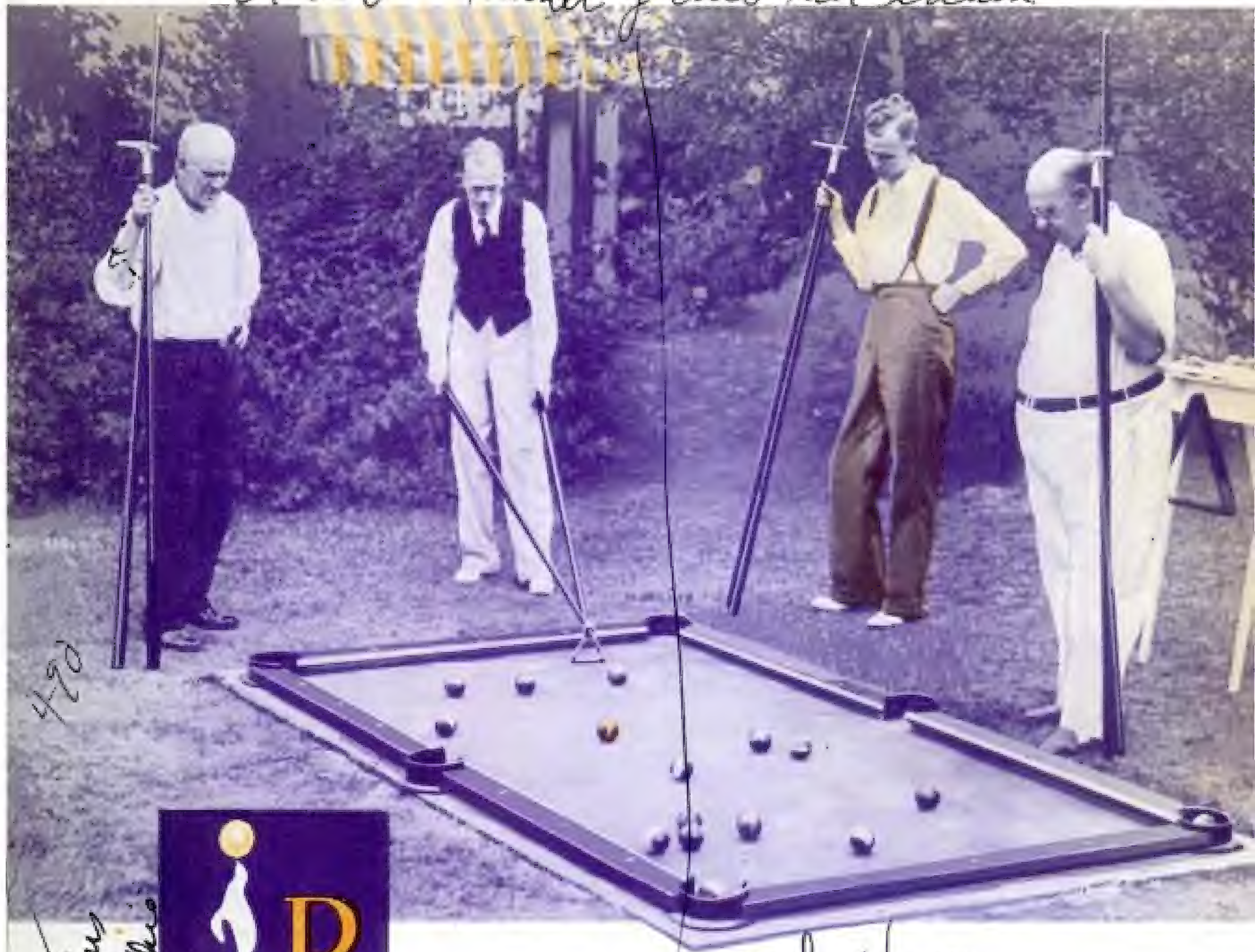
Photo Courtesy  
National Biscuit Company





81080

maker of cues not known



490



ICTURE Wall street paved in glittering gold, Fifth avenue paved in rich crimson or the streets of Wash-

ington with traffic lanes of red, white and blue!

These are possibilities as a result of current studies and developments in concrete. For colored concrete aggregates, in the latter stage of development, will produce concrete with the brilliance of precious stones, and in many colors. New Orleans suggests colored streets as a way to give personality to a city. The gay spirit of Mardi Gras has been permanently cast in old Canal street by paving with terrazzo, a popular and effective decorative treatment used primarily for building lobbies and corridors.

Such streets set a new tempo for build-

no dealer known

**BILLIARDS**, like bowling, has been made an outdoor game by concrete as evidenced by this happy scene.

ings, and as streets vie with nature in a riot of color, buildings may be expected that will rival the rainbow in a harmony of hues. A sample can be seen in Philadelphia where the magic stone, concrete, in a colorful and pleasing blue tone, houses another infant prodigy—radio. In California is another development in the new building era. Here is a type of construction well adapted to the art of painting with light, so dramatically portrayed at a Century of Progress.

California architects have developed a new concrete architecture, putting concrete to work as a self-sufficient structural material, needing no superficial decoration, and requiring no preservative coatings. In its natural tone it is admirably suited to serve as the canvas,

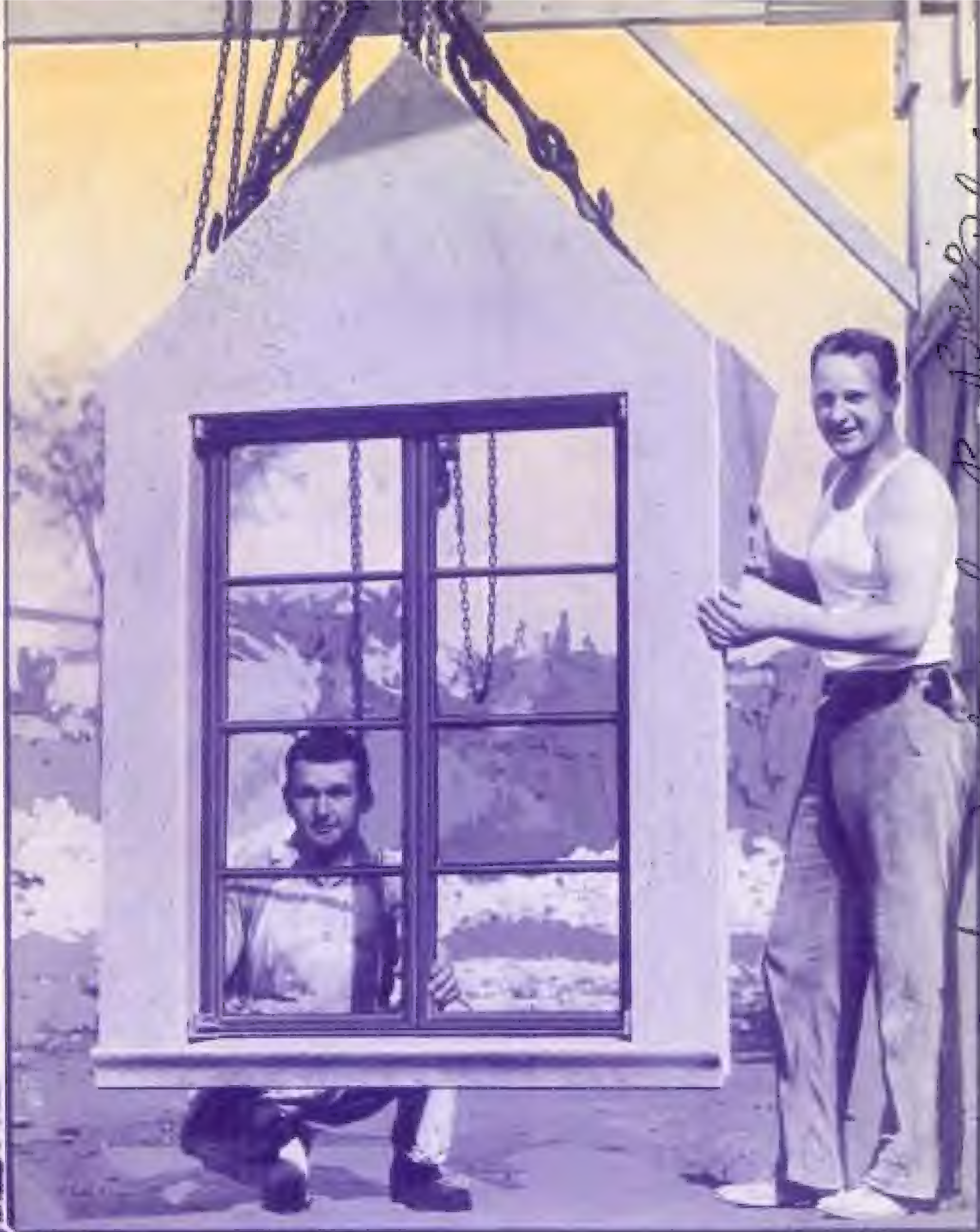
Cont. H. O. Hayes, 124-4th  
St. Wilmette, Ill.  
From Columbus  
Citizens  
Columbus, Ohio

490



81380

491



Washington D.C.



491

ABOVE, cast concrete window section for a prefabricated concrete home. Left, the beauties of nature are enhanced by this concrete setting.

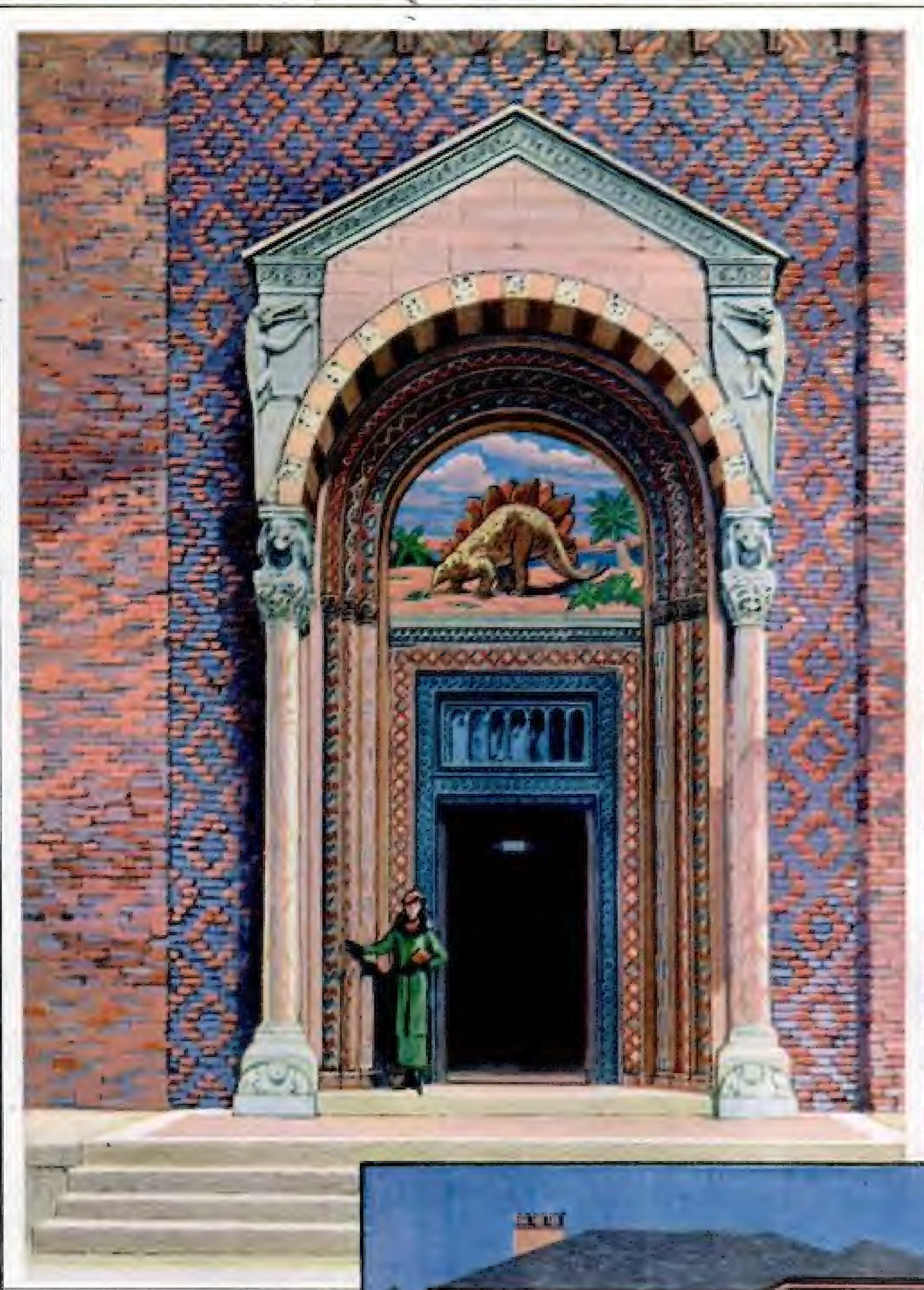
at  
391  
Carolwood  
Square,  
Los Angeles

Carley Process Corp.



81380

492



492

ENTRANCE to the reptile house of the Washington, D. C., zoo. The intricate geometric patterns of the reptile's back are reproduced in the concrete columns. Right, distinction and individuality can be incorporated in the precast concrete house.

*Early*







THIS entrance illustrates a modern interpretation of mosaics in colorful concrete by John J. Earley.

493 while the artist, with light, paints a symphony of color on it.

Or go to the Temple of Light, near Chicago, on the shore of Lake Michigan, there to see the tough, rugged sinews of concrete, jeweled with crystal-like fragments of quartz, so delicately molded that they give the appearance of a piece of fine lace. Then go to Washington, where the mechanics of prefabrication have been applied to a cottage to make it "fit for a king." Conservatively trimmed in colorful concrete mosaics, the house combines dignity with substantial warmth. These are among the spectacular ways in which



*Specifications from  
Portland Cement Co.  
23 W. Grand, Chicago*



494  
concrete may influence the daily life of tomorrow.

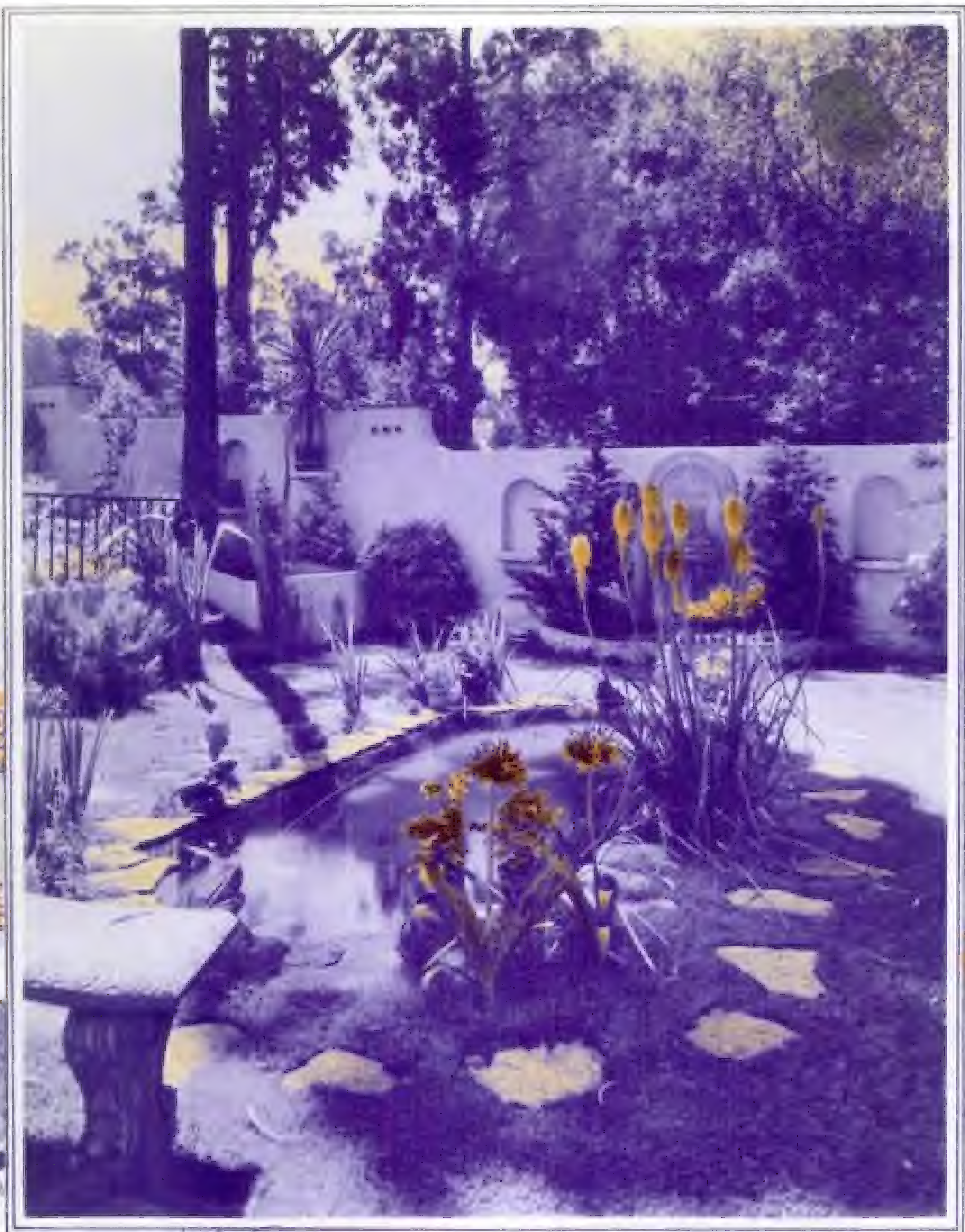
Cities today dump wastes in our rivers. Gone is nature's automatic control system against flood, drought, erosion, and filth-bred disease. Overburdened with man-made waste, streams are no longer refreshing or self-cleansing. Fish die, streams are condemned for water supply and for recreation. Slowly the water table has dropped. Floods and drought come and the soil, enriched through the centuries, is washed away. Science at last has gone to work replacing nature's prodigious automatic control system. River beds must be enlarged, head water areas turned into vast reservoirs by a series of dams, immense treatment plants built to convert poisonous sewage into harmless effluent before discharge into streams, floods brought under control and countless would-be land and soil destroying rivulets blocked. Less spectacular but more vital, concrete has been regimented for the big job ahead: that of replacing nature's automatic water-control system.

Picture a system of roads, singing with 100,000,000 spinning wheels of the highway—the locale of the world's



**TOP**, outdoor concrete ping-pong tables in public parks have brought this popular game many new enthusiasts. **Below**, one of the points of greatest interest in the horticultural exhibit at the Century of Progress was this "Old Mill Garden" with its concrete pool and flagstone paths.





495  
**ASSURING** privacy, the concrete fence also adds to the charm of this garden with its interesting pool and ornamental garden furniture.

greatest human slaughter. Overwhelmed by demands for good roads for a rapidly multiplying multitude of cars, road builders fail to anticipate an accelerated speed of travel. Needing roads designed for modern cars, a motor era cries for safety. Engineers now are planning safe roads, re-aligned to eliminate dangerous curves; rigid, true and even driving surfaces; wider roads, where traffic requires; separated traffic lanes to prevent head-on collisions; grade separations at

busy street intersections; non-skid pavement surfaces; elevated highways; pedestrian underpasses; highway sidewalks; bicycle paths; wide culverts and bridges, without dangerous columns and abutments; express roads free of slow-moving traffic. Concrete again fits into the picture.

Today we face a new era in personal comfort with air conditioning the year around, drafts eliminated, bedrooms and basements, and rooms between, all main-



61380.

Marshall Field Season  
of the floor.



496 SKILL, imagination and a sense of the artistic have been combined to produce this beautiful and colorful cement slayte, another of the hundreds of possible new uses for cement.

tained at livable temperatures, and nerve-racking echoes and re-echoes gone. A nation to be rehoused to new standards offers another field for the magic stone.

Major disasters still reap their toll. Earthquakes, fire, hurricanes, tornadoes and disease which thrives in dirt all are to be conquered. Homes, apartments, schools, churches, industrial and commercial buildings all can be made safe, and concrete can do part of the job.

Industry, seeking striking dress and modern style with which to  
(Continued to page 130A)



Box 496, Biloxi, Miss.

## Coast Guards Grow Wings to Save Life at Sea



*Twin-motored rescue and patrol plane of the U. S. coast guard air station at Biloxi, Miss., warming up its engines on the ramp preparatory to a flight over waters of the Gulf of Mexico*

Far out at sea a sailor is stricken with severe illness. A coast guard plane, "eye of the fleet," roars out over the ocean to rush him to a hospital ashore. A sudden squall menaces fishing smacks and small boats. Again the coast guard flyers race through the sky to give warning, survey the situation and coordinate rescue work by land and sea. More than 5,000 lives are saved and \$50,000,000 in floating property preserved every year by the coast guard. Founded in 1790, the service has made steady progress in lifesaving, prevention of smuggling, protecting customs, patrol-

ling the ice fields and international borders. The "air" arm, youngest branch of the coast guard, has rapidly expanded in importance during the last fifteen months as an aid to the cutters and shore stations. There are about fifty planes in the service now—all amphibious or seaplanes except those on border patrol. Coast guard aviation stations and air detachment units are located at Salem and Gloucester, Mass., Cape May, N. J., Miami and St. Petersburg, Fla., Biloxi, Miss., San Antonio, Tex., San Diego, Calif., Port Angeles, Wash., and Buffalo, N. Y.

## Designs Are Etched on Glass by Winter's "Sand-Blast"

Etching on glass with nature's own "sand-blast" is a favorite winter pastime of Cape Cod residents and the coast guardsmen who patrol the windswept ocean beach. Stencils are cut from paper and pasted on window glass or bottles, which are then left exposed on the shore. The fierce winter winds whip millions of grains of sand against the glass, quickly producing the effect of frosted glass. When the paper pattern is removed, the clean-cut design stands out against the sand-blasted glass. Cape Cod residents thus etch designs of boats, anchors, lighthouses and bits of "local color" for their front door panes.

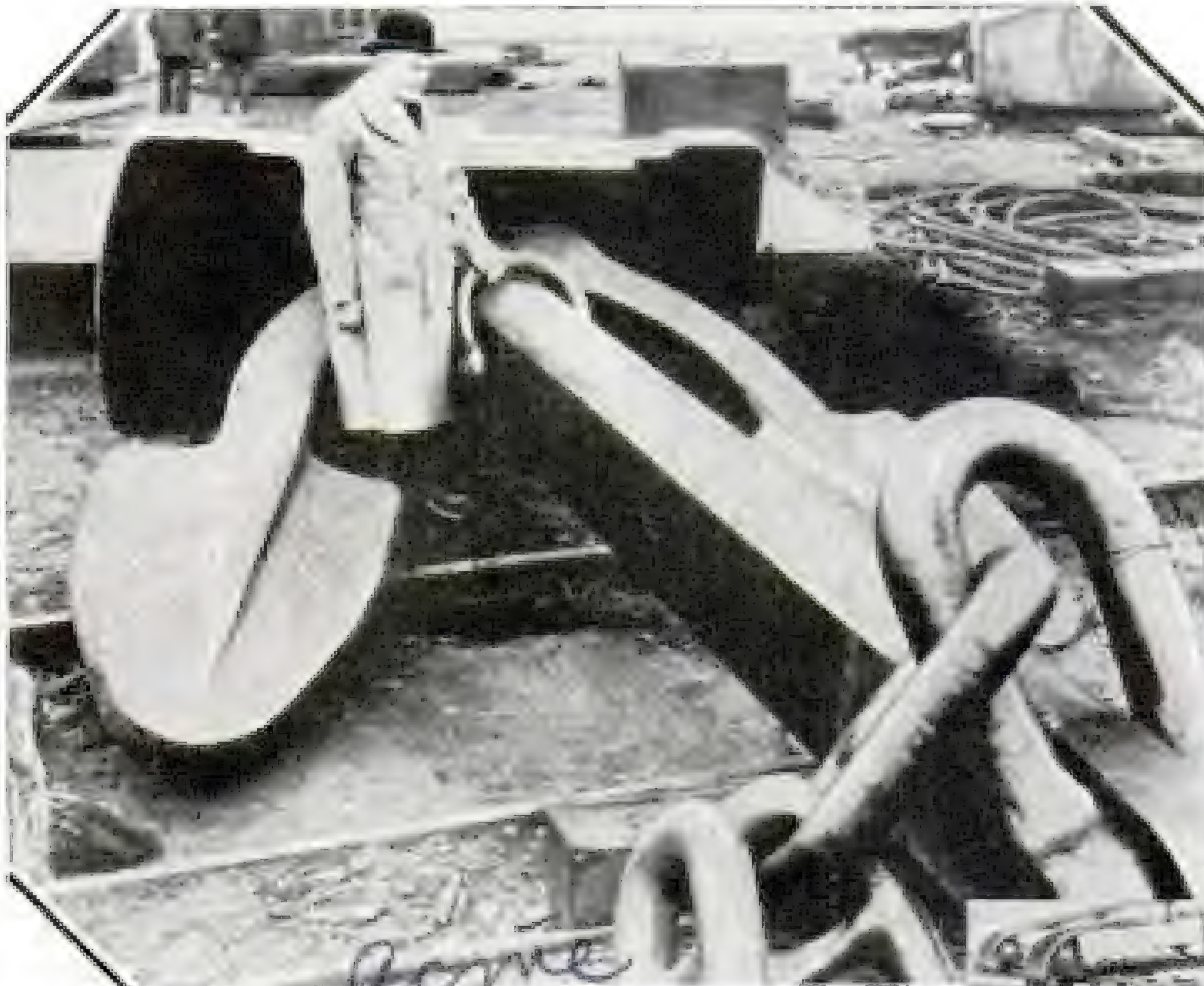


Capt. J. C. Johnson, 6 Priscilla  
Biloxi Road, Provincetown, Mass.

6 Priscilla  
Provincetown, Mass.



# Massive Anchors and Chains on Superliner



Three sixteen-ton anchors and 150 tons of anchor chains have been installed on the superliner "Queen Mary," for her maiden voyage from England to the United States. Two of the anchors will be in regular use, the third ready for an emergency. Each link of the massive chain is two feet long and weighs about 225 pounds. The liner is being fitted out at Glasgow, Scotland, to enter the Cunard White Star fleet.

Top, giant anchor ready for superliner. Bottom, massive chains for the anchors

## Robot Pianist Upsets Theory That Touch Controls Tone

Contrary to the theory of eminent musicians, the tone produced by striking a given key on a piano is the same no matter in what manner the key is struck. Ignace Paderewski is the notable exception among pianists who cling to the idea that the way the key is struck influences tone. Proof that the old theory is false was supplied recently by Prof. Charles Weyl of the University of Pennsylvania in a demonstration in which he used a giant model of a grand piano containing one key, one hammer and one string. With it, Professor Weyl showed that after striking the key the musician had no more control over the tone than a marksman has over a bullet after he has pressed the trigger of the gun. A mechanical pianist demonstrated gradations of tone so small that no ear could detect them, yet they were visible on an oscillograph.

Philadelphia

When the first railroad trains stopped at Chillicothe, O., conductors called out "Twenty minutes for quinine" and passengers at this "quinine stop" were given medicine to prevent spread of malaria prevalent in the region.



## Radio Brake Stops Automobile at Grade Crossing

Radio may some day prevent grade crossing accidents. A patent was issued recently for a "radio brake" intended to stop cars automatically at grade crossings if a train is approaching. The crossing would be equipped with two radio sig-

Science Service  
1/31/36

From Railway Age  
1/18/36 P. 154  
School of Electrical Eng.

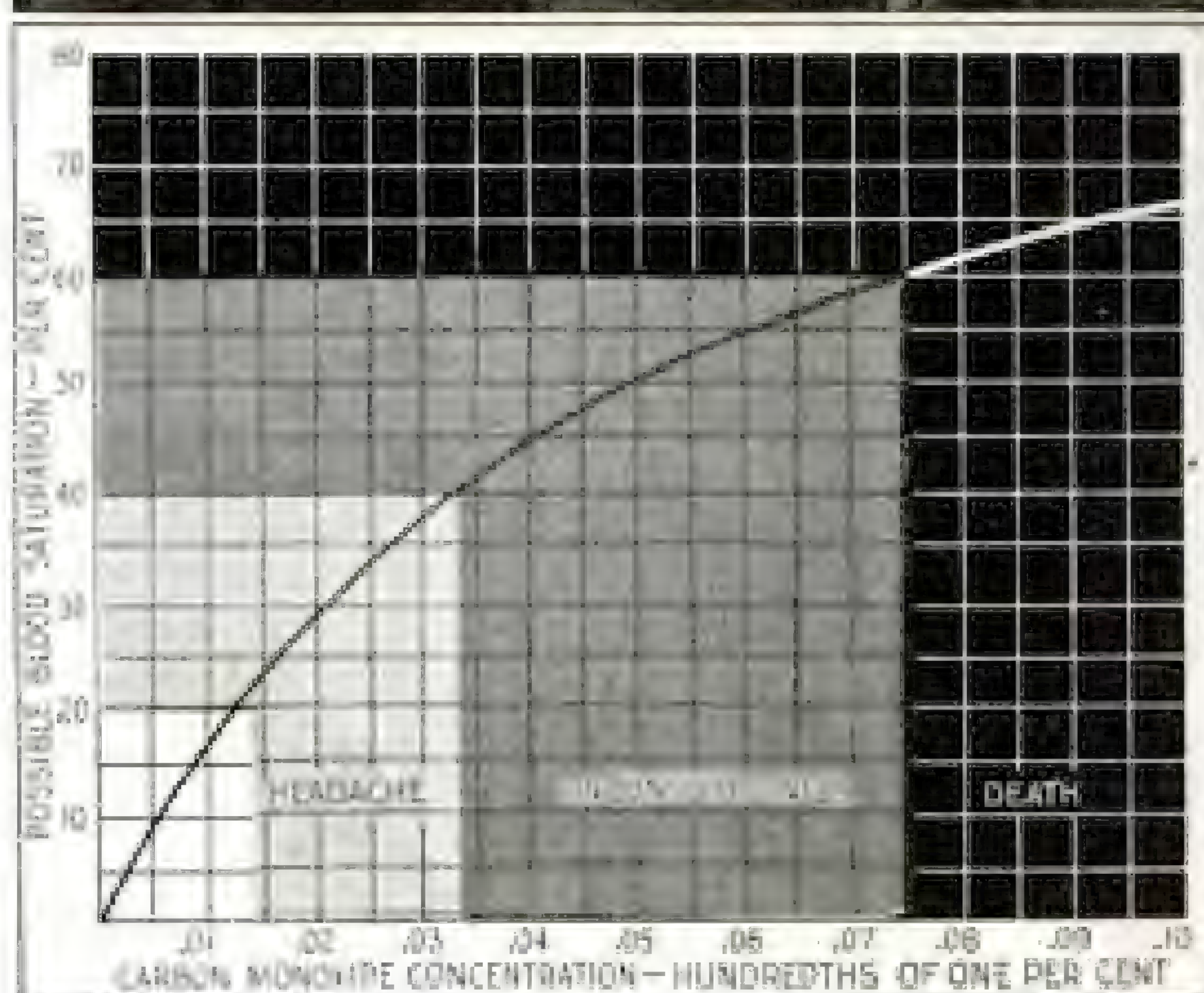
Science Service 1/21/36



*Chas. Jerome Berchfeld 23 W. 79th St. New York City*

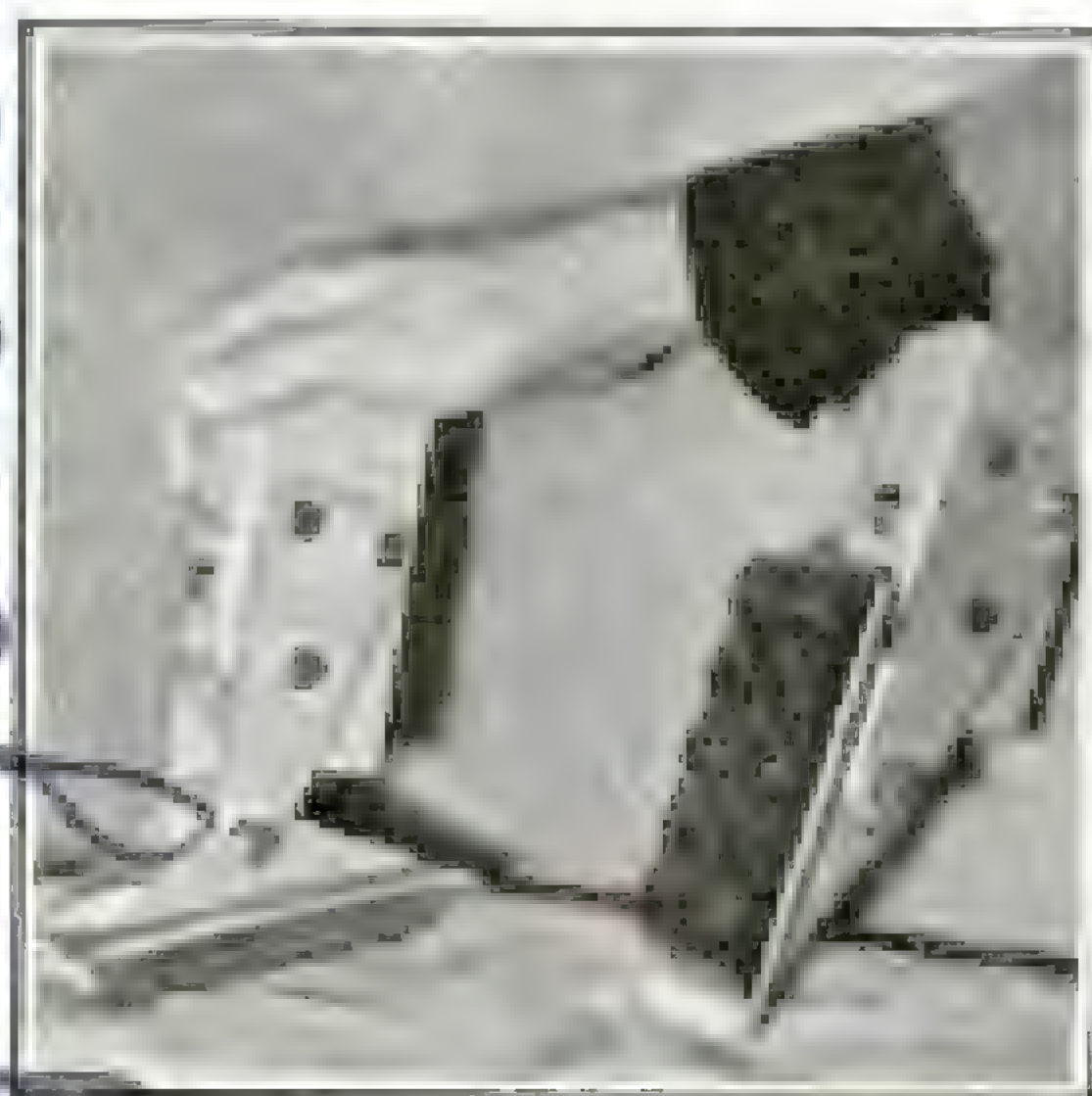
nalling stations emitting waves of a predetermined frequency down the road in each direction, the sending range being limited to about 500 feet. An approaching train throws a switch putting the stations on the air. An auto equipped with the radio brake carries a receiver tuned to the grade crossing signals which are picked up and converted into electrical energy. Amplified, the energy operates a relay which flashes a warning light on the dash. If the driver does not stop, a delayed relay goes into action and shuts off the motor. At the same time a small electric motor motivates an "artificial foot" which steps on the brakes and brings the car to a stop. The brakes stay locked until the driver releases them by stepping on the foot pedal.

## Gas Detector Shows Amount of Carbon Monoxide in Auto



Continuous carbon monoxide detector installed in car and chart showing carbon monoxide concentrations which will cause headache, unconsciousness and death

## Metal-Rubber Feet for Ladder Prevent Slipping



Ladders which are equipped with a new type of foot are prevented from sliding on smooth floors, ice or in dirt and cinders. The foot consists of a metal shoe with a rubber

suction-cup base. It swings through a quarter turn to permit use on floors and back for use in dirt or cinders. It may be adapted to the legs of any ladder.

Inquiries as to makers of articles described in Popular Mechanics, will be answered by our Bureau of Information upon receipt of return postage.

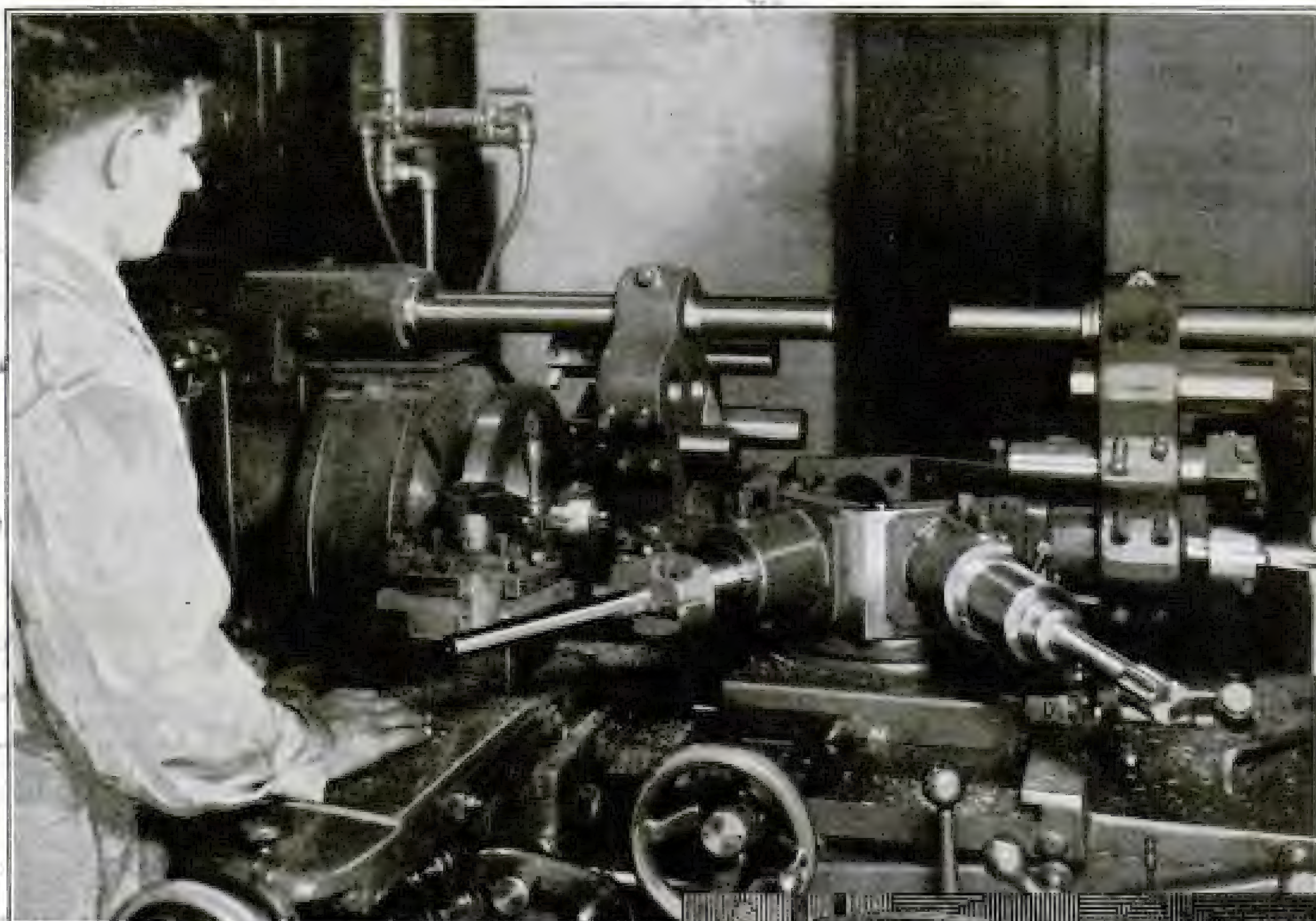
When installed in any closed car or truck cab, a continuous carbon-monoxide detector warns of the presence of this deadly gas. Very minute amounts of the gas lower physical and mental efficiency. The detector has a motor-driven pump which draws a continuous sample of air into the instrument. An adjustable flow meter maintains a constant flow of air and a dehydrating canister removes moisture from the sample, while a cell containing a catalyst oxidizes to carbon dioxide any carbon monoxide present. Heat liberated by this oxidation is directly proportional to the amount of carbon monoxide and is measured by thermocouples in series with the indicating meter. The meter is calibrated to read directly in percentage of carbon monoxide. The same unit can be used for testing the air beneath a man-hole cover or wherever the presence of this odorless, tasteless and non-irritating gas may be suspected.

*Safety Appliances Co. Quadrach, Pottsville, Pa.*

*mine*



61434



12.04.1940 J. H. P. - 11.2 67 removed photo - good

1. *Chrysomelidae* (beetles)  
 2. *Curculionidae* (weevils)  
 3. *Chrysomelidae* (beetles)  
 4. *Curculionidae* (weevils)  
 5. *Chrysomelidae* (beetles)  
 6. *Curculionidae* (weevils)  
 7. *Chrysomelidae* (beetles)  
 8. *Curculionidae* (weevils)  
 9. *Chrysomelidae* (beetles)  
 10. *Curculionidae* (weevils)

A black and white illustration of a young boy sitting on a wooden bench, working on a large wooden wheel. He is wearing a cap and a light-colored shirt. A small dog is standing on the floor next to him. The background shows a rustic interior with shelves holding various items, including a large wooden wheel and a chair.

500

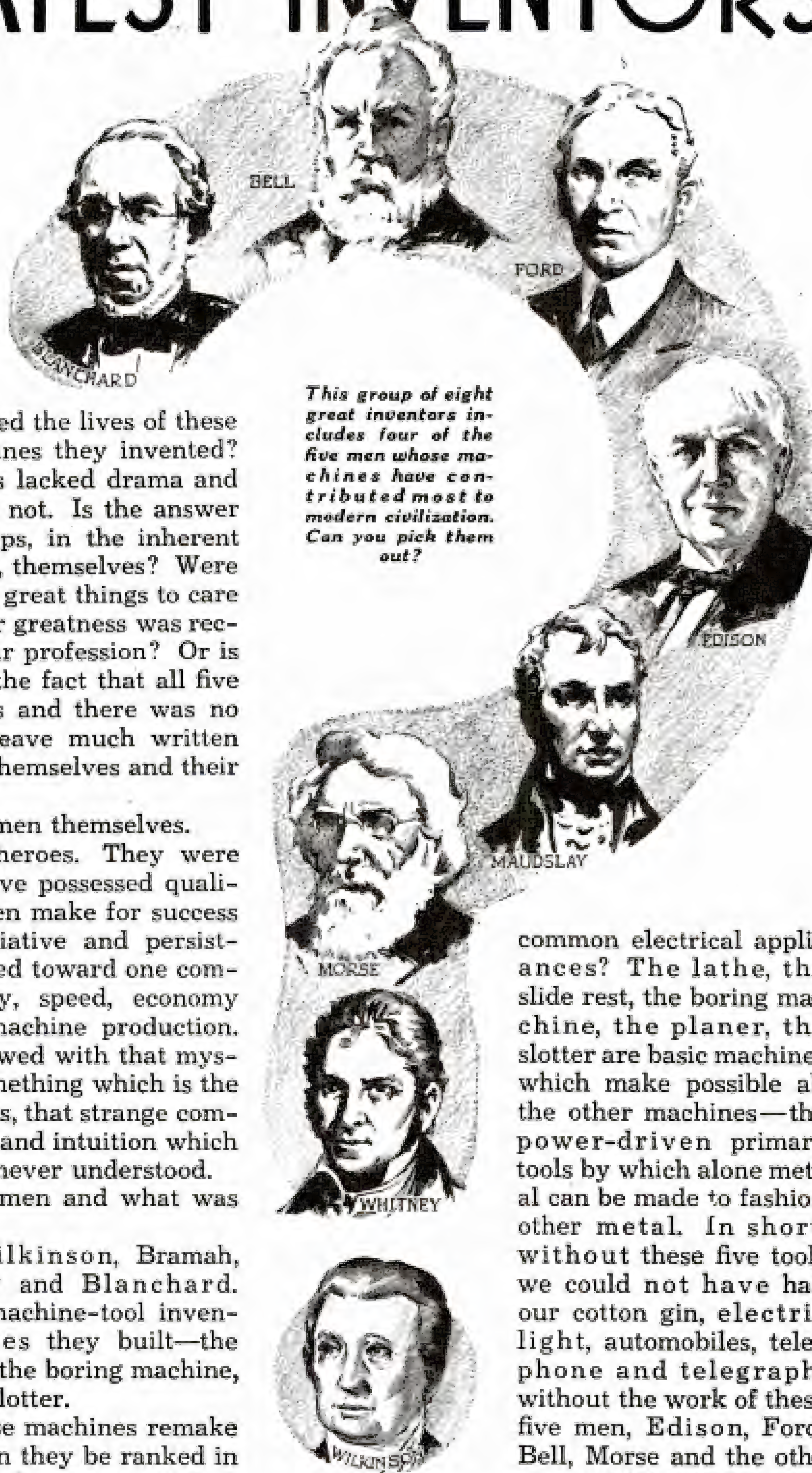
What is the explanation for the silence

shop from wood cut by Jean George Van Vliet. A comparison shows advance in shop equipment

00 Cont Miss Jacqueline Abbott Reyes  
40 Roberto Enrich Associates 2 3 2 1  
madison Ave N.Y.C.



# GREATEST INVENTORS



*This group of eight great inventors includes four of the five men whose machines have contributed most to modern civilization. Can you pick them out?*

which has surrounded the lives of these men and the machines they invented? Is it that their lives lacked drama and interest? Certainly not. Is the answer to be found, perhaps, in the inherent modesty of the men, themselves? Were they too busy doing great things to care whether or not their greatness was recognized outside their profession? Or is the explanation in the fact that all five died in the harness and there was no time for them to leave much written matter concerning themselves and their work?

Let's turn to the men themselves.

They were not heroes. They were workers. Yet, all five possessed qualities which most often make for success—self-reliance, initiative and persistency. All five worked toward one common goal—accuracy, speed, economy and efficiency in machine production. And each was endowed with that mysterious, burning something which is the heritage of inventors, that strange compound of reasoning and intuition which psychologists have never understood.

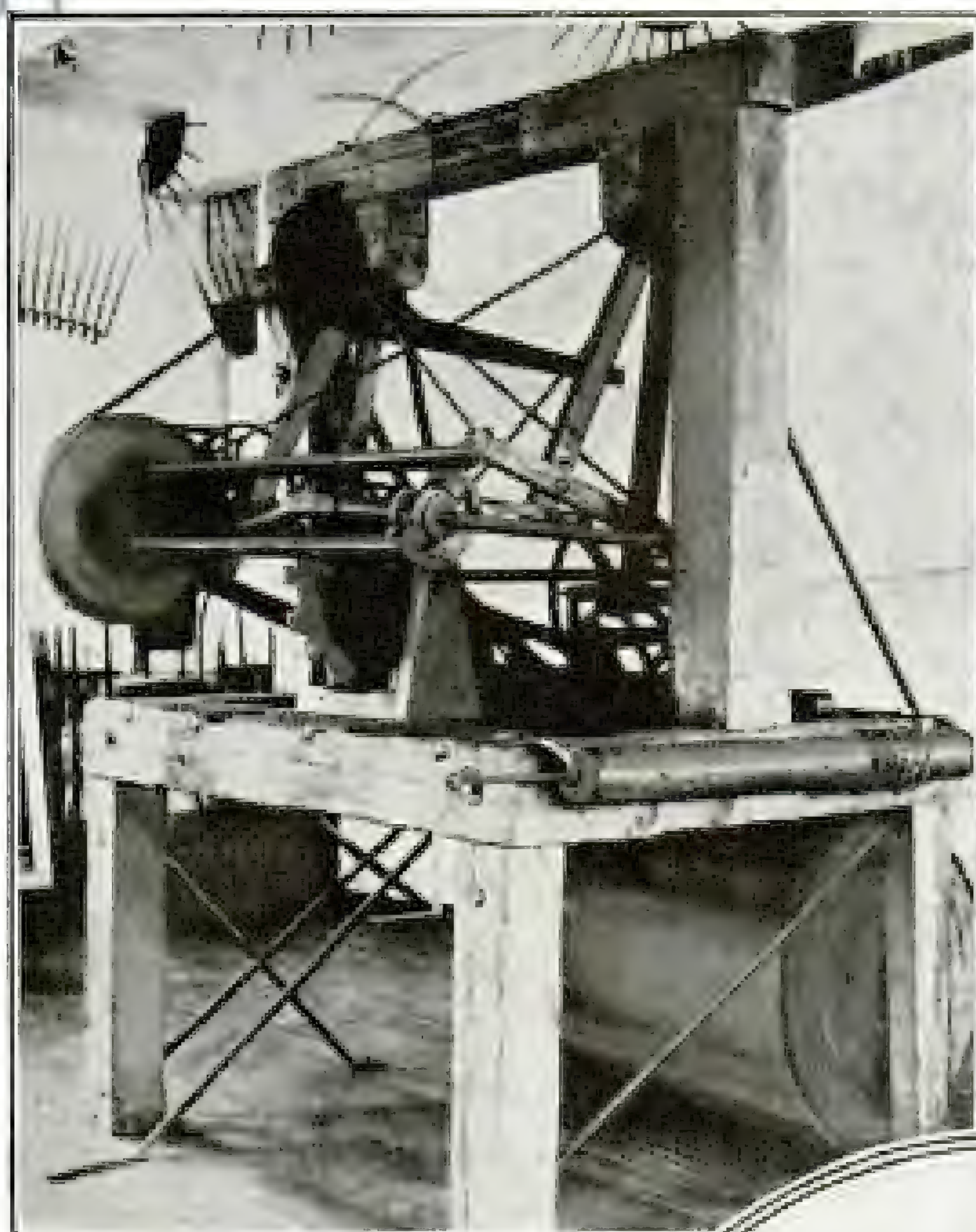
Who were these men and what was their work?

Their names—Wilkinson, Bramah, Maudslay, Whitney and Blanchard. Their profession—machine-tool invention. The machines they built—the lathe, the slide rest, the boring machine, the planer and the slotter.

But, how did these machines remake the world? How can they be ranked in importance before the steam engine, telephone, telegraph, reaper, thresher, automobile, airplane, radio and even

common electrical appliances? The lathe, the slide rest, the boring machine, the planer, the slotter are basic machines which make possible all the other machines—the power-driven primary tools by which alone metal can be made to fashion other metal. In short, without these five tools we could not have had our cotton gin, electric light, automobiles, telephone and telegraph; without the work of these five men, Edison, Ford, Bell, Morse and the others could not have built their epoch-making wonders. Think what that





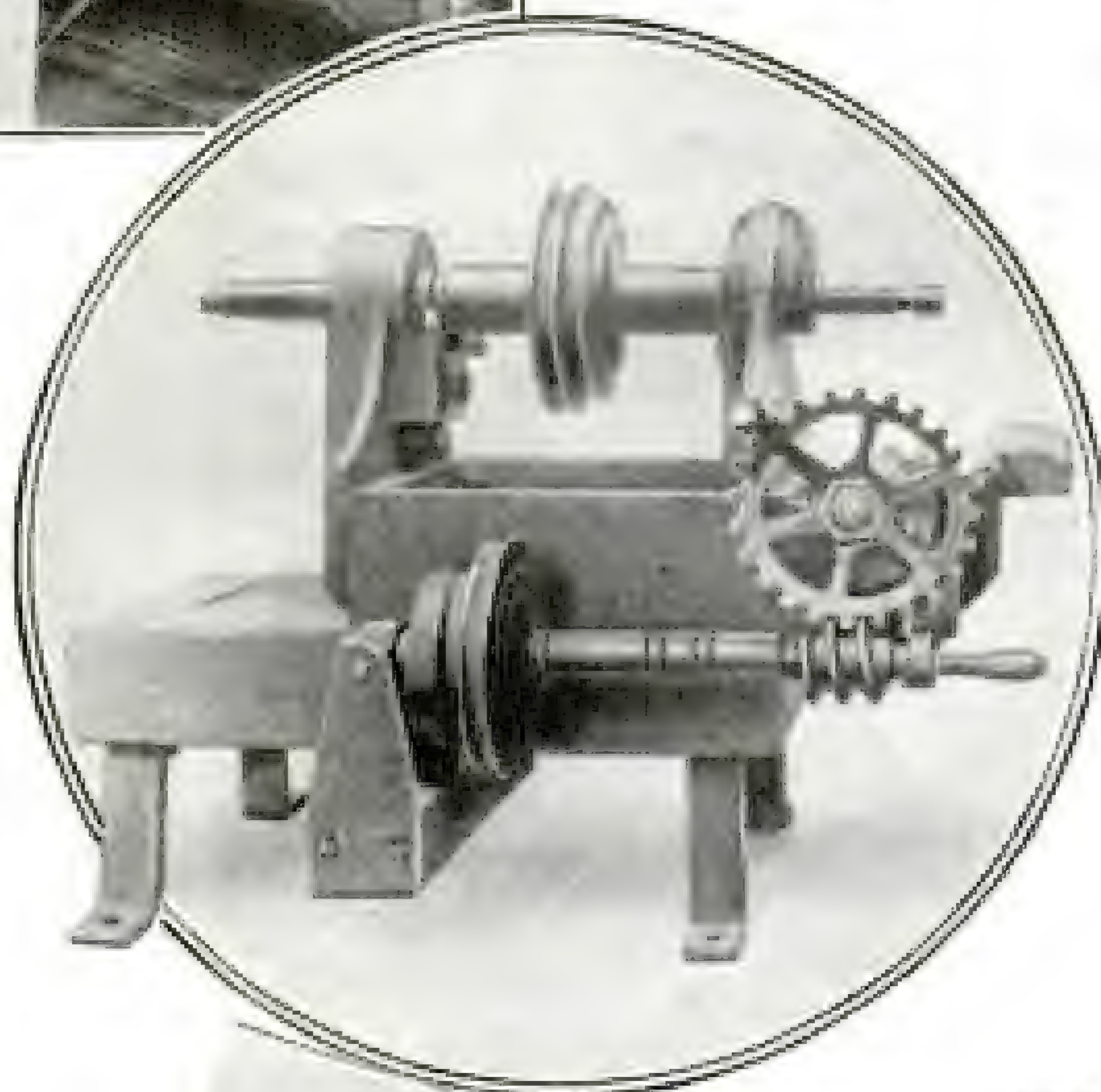
were no tools to carry out the ideas. It was not until 1764, goaded by the urgent demands of Cornish miners for a steam-operated pump to rid their mines of floods of water, that Watt once more took up the idea. By 1765 he built a model of his steam engine. But when Watt came to build a full-size engine, all his skill and the skill of the workmen around him was not sufficient to bore a cylinder six inches in diameter and two feet long. For the lack of a tool which could accomplish this simple machine operation the world was denied the steam engine for ten more years.

It is ironic that history has so little to say of the man who finally made the steam engine possible. His name was John Wilkinson. He was a machinist who, hearing of Watt's unsuccessful steam engine, started working on an idea of his own for making

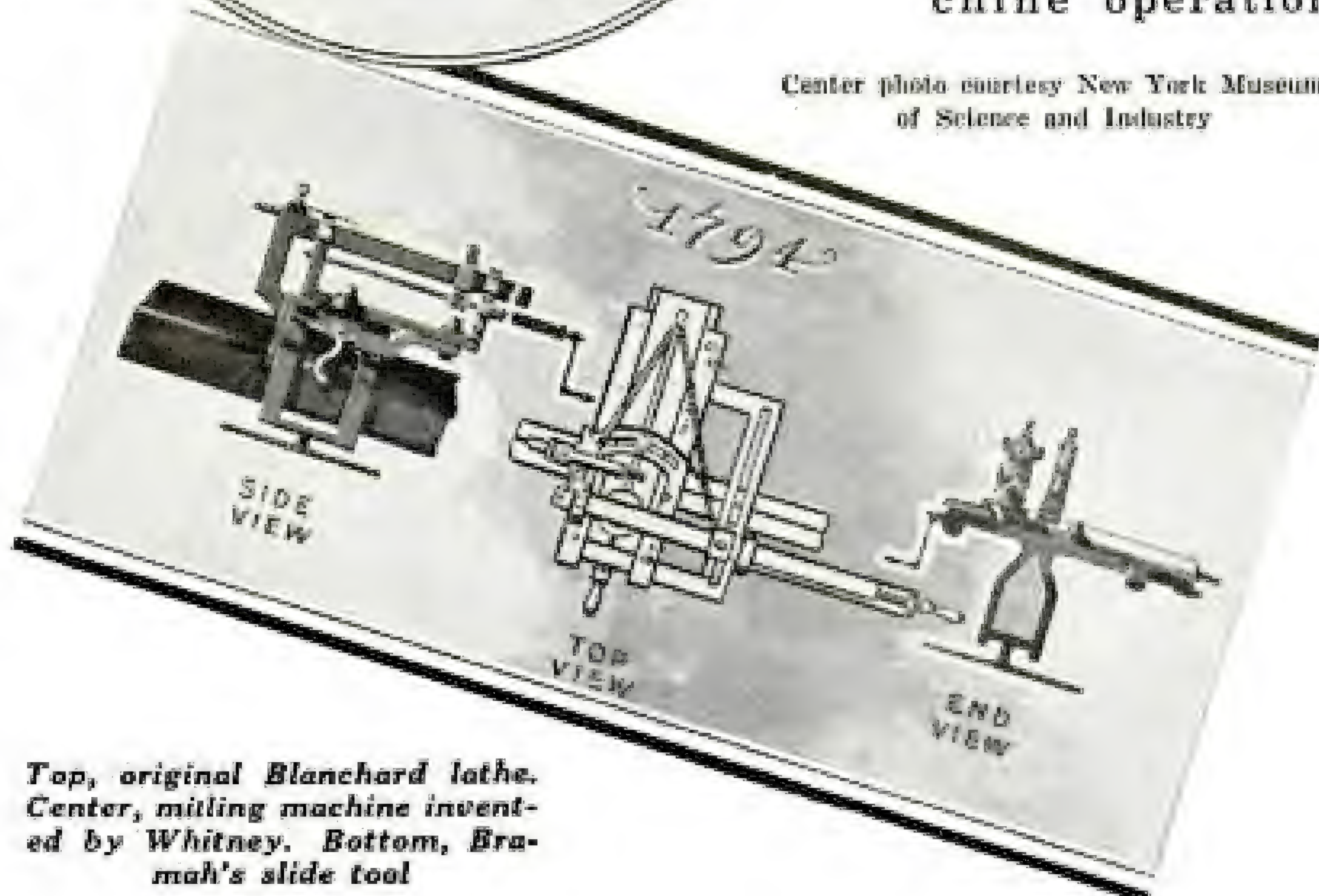
heavier the boring bar of the device then used for boring wooden drums, and of running it clear through the cylinder with a fixed support at the out-board end. Thus, the first principles of the modern, industrial-age boring machine were put into practice. Through that seemingly simple machine operation

means. Our whole civilization as we know it today has resulted from the quiet perseverance, the untiring labor of these men who worked for results and not for glory. It is probably safe to assume there are not more than a few thousand adults in this country who could tell you anything concerning four of them.

A graphic instance of the dependence of inventors upon machine tools lies in the story of Watt and his steam engine. In 1759, John Robinson, a friend of Watt's, suggested a steam engine might be applied to the moving of wheel carriages. The plans and theories were sound but there



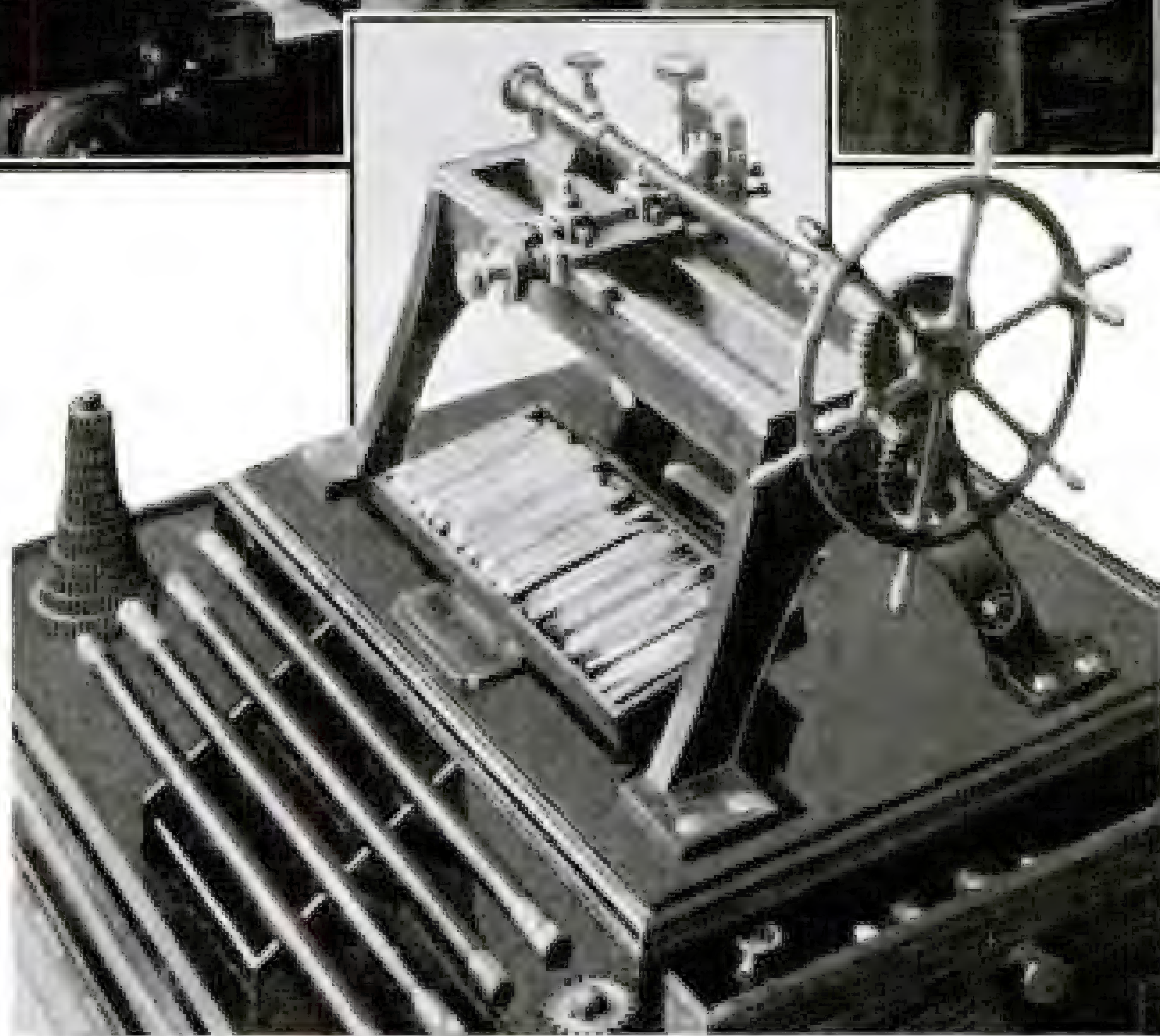
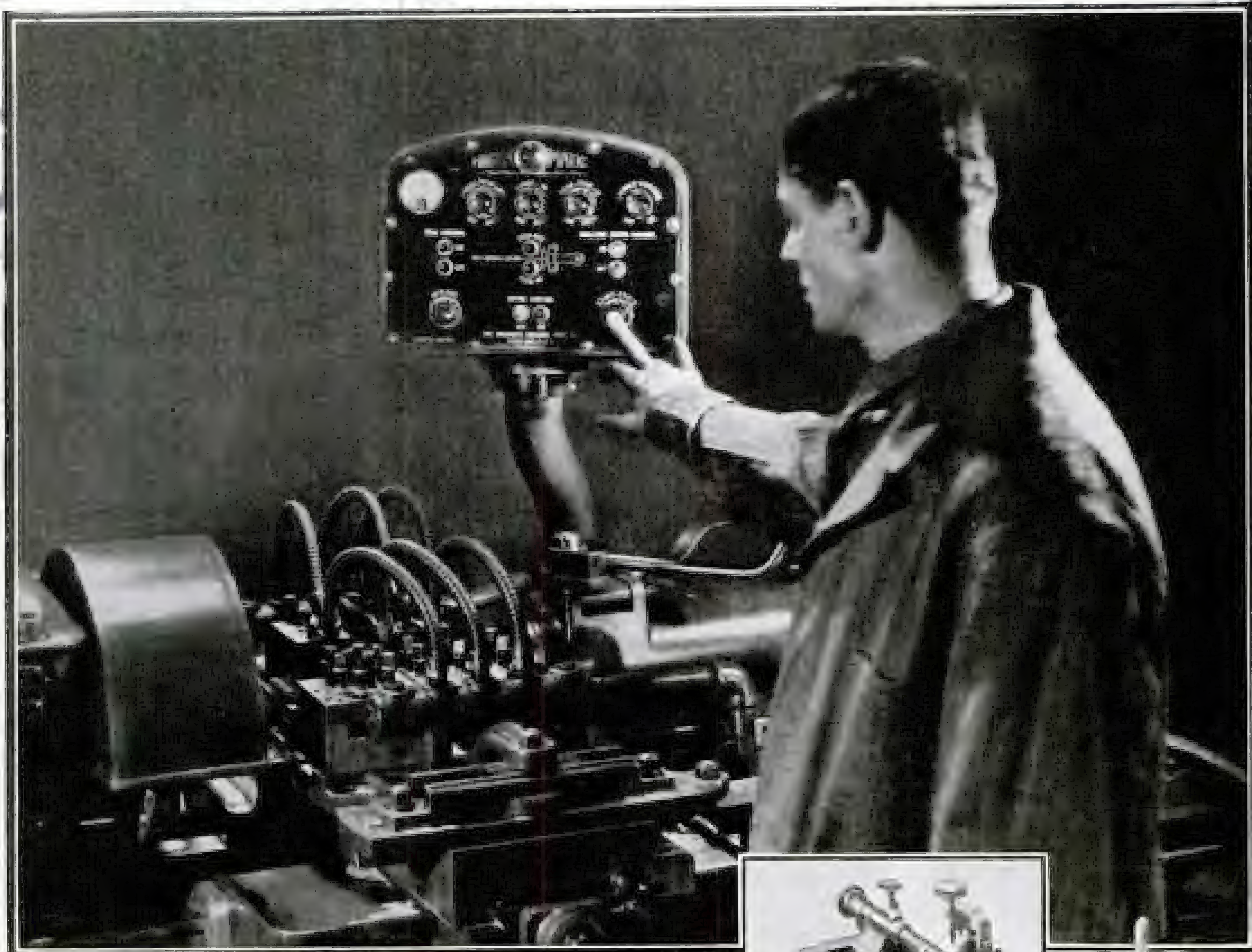
Center photo courtesy New York Museum of Science and Industry



Top, original Blanchard lathe. Center, milling machine invented by Whitney. Bottom, Brahma's slide tool



81434



Watt's fame became everywhere established, the Cornish mines were pumped free of water, the economic history of Britain was changed and a whole new series of machine operations was started. In spite of these facts, one finds little material dealing with the life of John Wilkinson, "father of the iron trade." But we know he was a man of extraordinary character and energy and perseverance. But what exactly is a boring machine—that device which made the steam engine possible and made so many other mechanical marvels feasible? In simple words it is a vertical or horizontal machine for boring holes in metal held fast by a locking device.

As great as was Wilkinson's influence on machine-tool design, Joseph Bramah exerted an even greater influence. Born in 1748 on a Yorkshire farm, he moved to London in early life to work as a machinist. London was besieged with petty thieves and Bramah turned his attention to build-

ing a lock which could not be picked. He worked on the invention for years until he finally manufactured a lock which for sixty-seven years was regarded as unpickable. Later he developed a hydraulic press. Because of his reputation the Bank of England commissioned him to build a machine for printing the date lines on

(Continued to page 124A)

Top, lathe with slide rest and full electrical control. Below, Maudslay's cutting lathe



## Solfia Is Played by Hand and Pumped by Lung



This table-top instrument was named the "solfia" by its inventor, a German orchestra conductor

Youngest child in the family of wind instruments is the "solfia." Something like a baby organ, it has a miniature piano keyboard a little more than an octave long, but its music depends on air. The player can either blow through a rubber tube or use a bellows. The solfia was designed by Hans Kaulbersch, as a low-priced musical instrument for the home.

## Highway Guard Rail Made Safe by Resilient Cable Bracket



Resilient brackets of strip steel are the latest type of shock-absorbing support for roadside guard rails. Nearly circular in form, they have overlapping ends and are slotted for the cables of the fence. Held in the slots by an oval pin, the cables can slide

freely in either direction at the post connections and the shape of the bracket makes it act as a buffer when the guard is struck by an automobile.

## Diving Helmet Used by Coach of Swimming Team

Underwater observation of swimmers has been adopted by Robert J. Kiphuth, coach of the Yale teams and of the American Olympic team, and he wears a diving helmet on the job. Coach Kiphuth says that this is the best way to get a true image of the swimmer, since refraction, waves and bubbles tend to distort the image when the swimmer is viewed from above the surface. The diving helmet makes it possible to watch each swimmer. The diving outfit consists of weighted vest, helmet and ropes, the last for safety purposes because Coach Kiphuth cannot swim a stroke, in spite of having developed champion swimmers.

## Steel Ropes Lift Bridge Span into Place High above Bay



Midway between towers of San Francisco Bay bridge the skeleton of a 540-foot span is hung

Far above San Francisco bay hangs a 540-foot center span of the great suspension bridge that is to make Oakland and San Francisco closer neighbors. In nine sections, this skeleton was lifted into place in the middle of the suspension cables by steel hoisting ropes, and now is supported by the vertical cables looped over the two

The Iron Age 12/19/35

P. 33.

A message of steel & wire  
208 by S. H. S. S. S.

Com. Patrick B. Keating  
20 Church St.  
Hingham, Mass.

Com. Patrick B. Keating



main suspension cables. The upper horizontal beam marks the level of the top deck of the four and one-half mile bridge, and the bottom deck will be at the level of the lower beam.

## Chemical Corp Canned Fumigant Set Afire

F67 Floods Greenhouse Quickly



Nicotine fumes, forced out at high pressure when the powdered fumigant in the can is lighted, quickly spread through the greenhouse

## F110 Prism Glasses Help Bedfast Reader by Reflecting Book

Recumbent spectacles have been designed to make reading in bed more comfortable and less tiring. Specially devised prisms reflect the light clearly, without inversion or coloring of the image, so that the reader may hold his book in a comfortable position on the chest and direct his eyes straight upward in the normal and least fatiguing way. The spectacles are especially valuable to patients forced to lie in bed for some time. They may be worn over other spectacles.



These spectacles reflect book held at right angles to the eye and make reading in bed less fatiguing

By generating pressure in a can of fumigating powder, a greenhouse can be quickly and thoroughly flooded with nicotine spray to kill insect pests. Heretofore burned in open piles, nicotine powder is now available in hermetically sealed cans with two "eyelets" on opposite sides of the top which are punched open when ready for use. A lighted

"sparkler" is then inserted in one opening and the powder quickly ignites, forcing out fumes under increasing pressure as it burns. The speed of distribution enhances toxicity of the fumigant. A pound can is effective for 25,000 to 30,000 cubic feet.

## Two Signals on One Frequency F72 Solve Radio Problem

Transmission of both voice and radio range signals on the same frequency is being tested as the latest aid to commercial aviation. The two sets of signals are received simultaneously in an airplane, directional signals operating a needle pointer on the instrument panel and the voice signals being received in headphones. The development solves the problem of interruption of directional beacon signals and weather reports when both were sent on the same frequency.

Almer Col & Co 105 N Wabash Chicago

Science Service  
1/49/36



# Doughnut Boat on Plane Saves Flyer in Sea



*Self-inflating "doughnut" boat of rubberized fabric which keeps flyer afloat if plane comes down in water and also supports the plane so it can be salvaged*

Successful tests have been made in England recently with flotation gear for airplanes intended to save the flyer in case his ship is forced into the sea and also to serve as a buoyant support for the plane

so it can be salvaged. Various types of gear have been tried, one consisting of atmospheric bags laced within the fuselage, air being stored in them at atmospheric pressure. There are also buoyant inflat-

98 R. S. Youngman Esq. Hayes  
Fairey Aviation Co Ltd. Middlesex  
England



able bags which may be filled in an emergency with carbon-dioxide gas released from a cylinder by automatic or manual means. The third type is known as the Youngman dinghy and is a big doughnut of rubberized fabric with a "floor" in the center. The deflated tube is stored in a compartment in the top of the wing together with a cylinder of carbon-dioxide gas and cables which link it to the plane. The dinghy may be inflated manually or by actuators which release the gas when the ship is slightly submerged, causing the dinghy to burst open the lid of its compartment and escape. The passengers enter the dinghy which supports their weight and the weight of the submerged plane. If a ship is near, the cable leading from the dinghy to the plane can be attached to the ship's derrick and a release cable can be operated to cut the dinghy adrift, allowing flyers and plane to be saved separately.

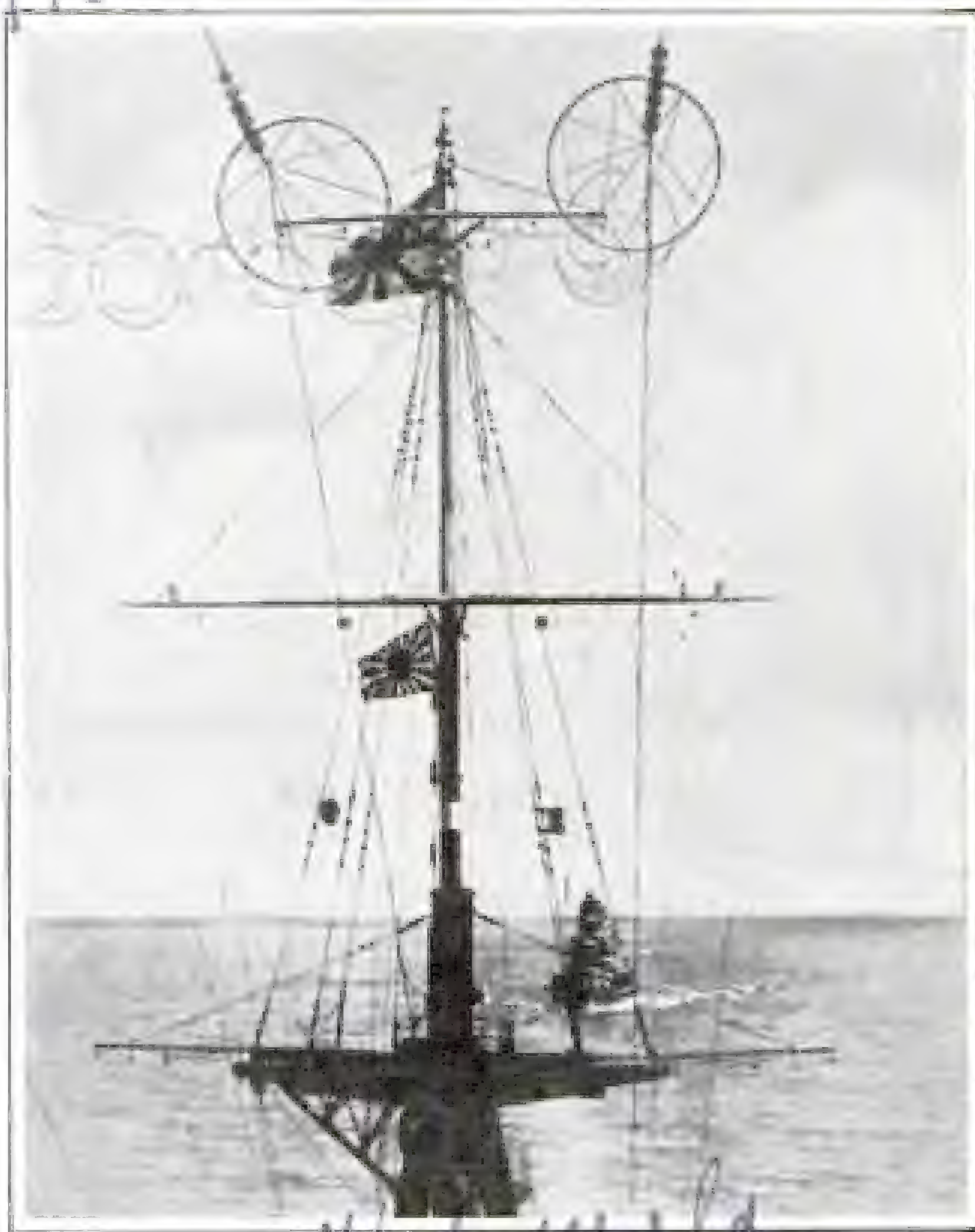
### Fountain Brush Cleans Typewriter with Liquid

Cleaning typewriters, rubber stamps and adding machines is made easy with the aid of a fountain brush which releases a liquid cleaner when a valve button on the back of the brush is pressed. The bottle containing the cleaner forms the handle for the brush.



Fountain brush for typewriter which releases liquid cleaner when valve is pressed

## Warship's 'Voice' and 'Ears' Aid Maneuvers Far at Sea



Looking through elaborate antenna arrangement high above deck of battleship during maneuvers of the Japanese fleet

How a modern fighting ship can perform intricate battle maneuvers at night, in murky weather or behind a dense smoke screen without the use of signal lights or flags may be a puzzle to the landlubber. But the answer is simple. High above the glistening decks of the ship is an elaborate arrangement of wires, the very latest type of radio antenna, which is a clue to the puzzle. By means of these wires, the ship "speaks" or "listens" as the radio operator transmits or receives orders. Navigating these big ships blindly is made easy by use of radio, and modern navigating instruments. Japanese dreadnaughts, recently engaged in maneuvers in the Pacific, are equipped with the newest radio apparatus.

One-thousandth of an ounce of thyroxin, a mysterious chemical substance in the body, separates every normal human being from imbecility or death.

Speed. No.  
Purvis & Mfg Co  
Orange, Mass

New York Isotone  
Committee Inc.  
45 E. 45 St  
New York



27 Meacham Road  
West Somerville  
Mass

61550

# DIVING



Capt. John D. Craig and an undersea camera of his own design which he uses among the sea killers. Below, nurse shark with remora or sucker fish

Photo at left courtesy  
Paramount Productions, Inc.

**H**E'S engaged in the most dangerous and thrilling business in the world!

Captain John D. Craig is the man whom the big movie producers usually call upon when they want such exciting jungle or submarine scenes as—

A hungry and wounded tiger charging....

An octopus on the bottom of the ocean seizing prey with its deadly tentacles....

A man-eating shark rushing a diver....

Killers of the jungle in furious action.

Only thirty-one, an expert deep-sea diver, inventor of the submarine camera, authority on big game hunting and fishing, he has led his camera crews into more than thirty-nine different countries and to the depths of the Atlantic and Pacific oceans.

**By Capt. John D. Craig**

**W**HAT a thrill my first dive was! I think I was most impressed by the utter silence of that strange undersea world. It's so quiet down there it almost hurts. All the weird and unusual under-sea denizens crowded around to greet me. They were not afraid but seemed to as-



sume I was just another poor fish like themselves.

Crouching in the dark corners of rocky ledges ugly crabs and lobsters peered out at me. The light was dim and of a greenish hue. A silvery cloud of minnows floated by overhead, bending to and fro to the swell of the sea. A six-foot marrow, or jewfish, loomed out of the distance and cruised around me with the effortless ease of a floating dirigible. He goggle-eyed me and departed into the grey haze. I was elated, scared and breathless all at once.



see Sept. 1937

340 Oct 1937  
508

E155Q

# Among SEA KILLERS



*Head and jaws of a blue fin shark and, below, Capt. Craig and a baby seal he captured*

Somehow I managed to follow my instructions sufficiently to survive that first dive, and immediately I became a devotee.

I have dived hundreds of times since. Every dive brings new thrills. I can honestly say I have learned something new from every dip.

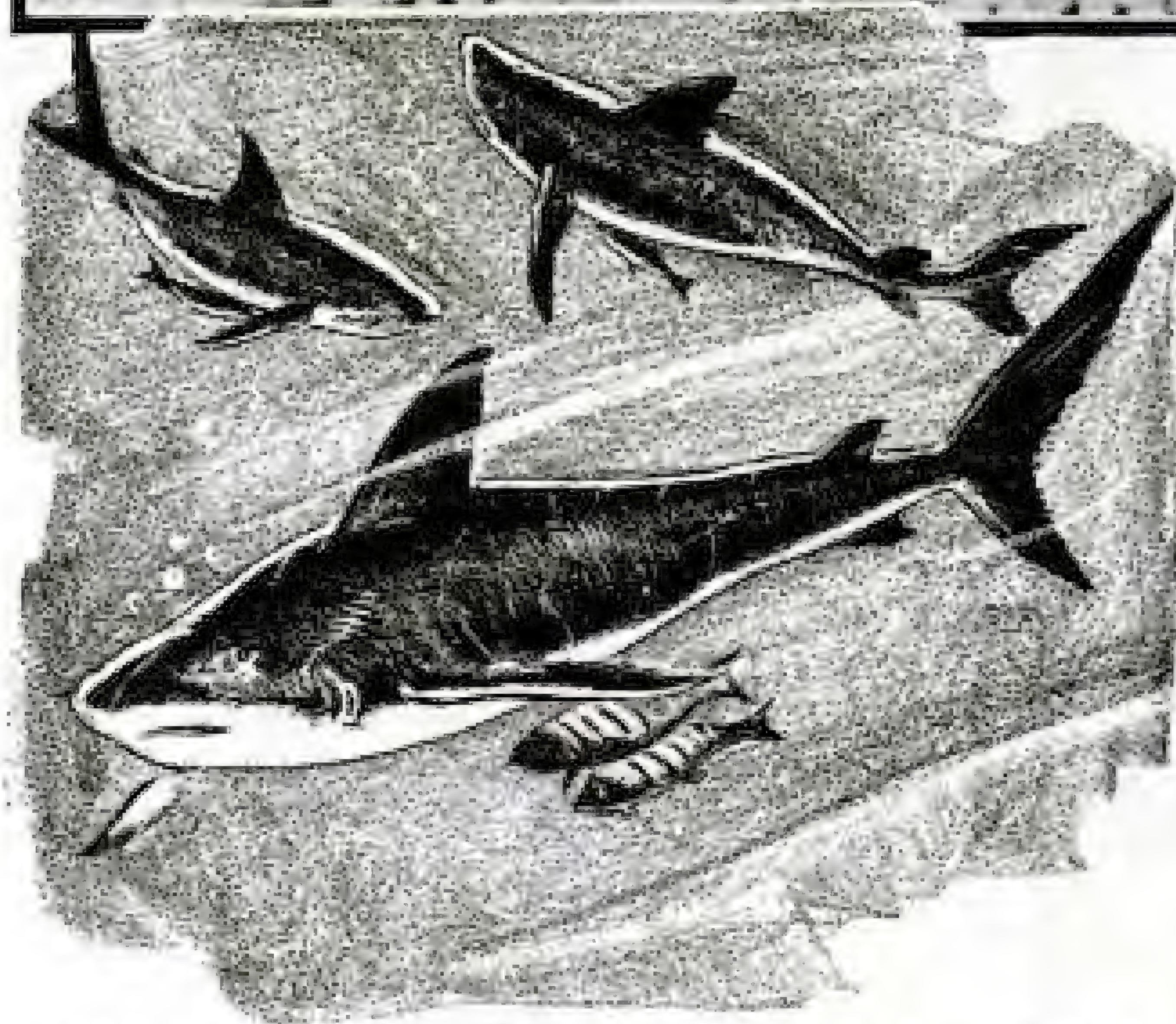
My first dive was made in tropical waters off the lower coast of Mexico. Japanese divers were my instructors. The gear I used was such an out-of-date contraption I still wonder there wasn't an accident. The Japs are "sargassa farmers."

These "farmers" had their fields on the bottom of the ocean. They actually went down there and cultivated the sea floor. They worked in standard—about 1905 model—diving gear. Their "crop" was a sea plant known as sargassa, used in making various medicines. Agar-agar is the best known by-product.

It takes from four to nine years to prepare the sea bottom and clear away destructive parasite plants before good sargassa crops can be harvested. The Japanese dry the sargassa, bale it and ship the lot to Japan. Once under cultivation the crops grow constantly and a good diver can gather between \$80 and \$350 worth of sargassa per day. They deserve it for they take terrible chances.

It was a tough school in which to learn the hazardous game of deep-sea diving, but the Japs were good instructors and I acquired many tricks of the game that have been lifesavers on several occasions. I first learned to dive because I wanted to know whether it would be practical to shoot undersea a certain picture we were preparing in Hollywood, or do it in a tank as the studio wished. We made it under-seas. I have shot several undersea pic-





*The author and a striped marlin swordfish. Below, blue fin shark, a man-eater, and pilot fish*

tures since. There is something about that weird underwater world that gets under one's skin.

Four of the boys in my crew are now expert deep-sea divers. We still thrill at the thought of our first dives with that antiquated gear. The last time I passed Cedros island I counted twenty-two graves in that little Japanese cemetery. There were only nine when we first learned to dive there. They still use the same old gear. I have since learned they lost most of their casualties when the boys got fouled in the kelp beds and the tenders broke the lines trying to pull them out. Manta rays, those huge bat fish, also fre-

quent Cedros waters and probably broke some lines. No, diving is not a healthy game. We do it because the public demands authentic pictures.

I have been asked a hundred times, "What do you do when you meet an octopus on the bottom of the ocean?" I stand perfectly still, tuck my hands under my arms, hold my breath and then hope for the best.

"Don't move when an octopus takes hold of you," they told me repeatedly. "It will get excited and attack if you struggle. But if you remain perfectly still the chances are it will merely touch you here and there with a tentacle just to satisfy its curiosity and

will then move away." Those warnings saved me dozens of times from a horrible death in the arms of octopuses that measured from fifteen to eighteen feet. There are octopuses much larger, but I hope never to meet them. An octopus with tentacles eight or nine feet long is tremendously powerful and a most formidable antagonist should it become aroused. Those big fellows can devour an average human, stripping the body of all flesh and blood in from fifteen to twenty-five minutes.

Octopuses usually frequent dark and rocky places on the ocean bottom, and the larger ones are found in colder waters. The female lays 40,000 to 50,000 eggs near



the mouth of some cave in subterranean reefs, where she remains during the fifty-day hatching period. She is very temperamental and will strike out in anger at any intruder so the undersea denizens give her a wide berth. When hatched, the baby octopodes are about the size of a garden pea. They have very short legs and cannot move about without swimming. Usually they rise immediately to the warmer sunlit surfaces where birds and fish devour them by the thousands. If this were not the case the sea would be literally swarming with octopuses. The few survivors seek homes in the shallows near rocky shores. Their first food consists of minute animalcules floating in the water.

As they grow stronger they seek deeper waters. Within a year they have grown to be four to five feet in breadth and feed on shell fish, perch or bass. When moving about they walk on their eight arms or swim backward by expelling water through a locomotor tube just under the head. A large octopus can dart about in this manner with surprising speed. Each tentacle is armed with from 160 to 240 vacuum cups which can exert a pressure of from one-fourth to nineteen pounds per square inch. When attacking their prey, they retain a firm hold on the bottom with three or four tentacles and grapple their adversary with the others.

The principal weapon of the octopus is its parrot-like beak concealed in the very center of that many-armed hood. With that beak a large octopus could easily rip open a deep-sea diving suit. The most practical defense against such a foe is a nitric gun, a type of plunger pistol loaded with glass-enclosed cartridges of nitric acid. When this is discharged in the water near an octopus the creature inhales it and is killed instantly. This gun is a recent development. We were not armed with them when shooting pictures off Mexico.

The Japanese divers there, however, did give us a hint that worked. An octopus is baffled if it cannot find firm "ground" for its suckers. Without a solid foundation it cannot exert that vacuum pressure, and when it realizes this it departs. We found by wearing a coverall made from porous burlap over our diving dress, the octopus could not seize us.

(Continued to page 138A)

## Cymbal Maker Uses Secrets Three Centuries Old



One corner of foundry where cymbals are tempered carefully to obtain tone purity

When the cymbal maker, Avedis Zildjian, makes a set of the shining metal disks for the modern orchestra, he uses a tempering process which has been a family secret for more than three centuries. The cymbals are produced at the Zildjian foundry in Massachusetts for many prominent orchestra and band leaders.

## High-Priced Gold Spurs Mining for Billion-a-Year Output

Increased buying power of gold is sending the output higher and Dr. Adolph Knopf of Yale University predicts the world production will exceed \$1,000,000,000 a year within a short time. This output, Dr. Knopf says, will establish an equilibrium between production and the present purchasing power of gold. Better methods in mining and metallurgy and improved transportation facilities are expected to accelerate mine operations and production. Such inaccessible regions as the two million square miles of pre-Cambrian rocks north of the Great Lakes may be developed by means of the airplane.

Professor of Geology  
New Haven Conn.



## Exact Models of Royalty Save Trips to the Tailor



© Planet News, Ltd.

Attaching hair to heads of models. Note the life-like appearance of the completed head on the table

Kings and queens are saved the trouble of frequent fittings at the tailors' and dressmakers' by an artist who prepares papier-mache models of royalty. Provision is made for loss or gain in weight by layers which can be added to, or removed from, the model. Each model is made from exact specifications of linings prepared by the tailor after taking measurements. Among those for whom the artist, J. A. Gems of Kensington, England, has made models are King Edward, King George, Queen Mary and members of royal families of other nations. Hospitals, fire brigades, and the police also make use of the models, which are constructed of a substance almost as soft as human flesh.

### Music Changes Color Lighting on Liner "Queen Mary"

Color tones of illumination in the main ballroom and veranda grill of the superliner, "Queen Mary," now under construction, are controlled automatically by a microphone in front of the orchestra platform. The lighting is changed by the pitch of the notes played or sung, a high note producing color lighting of utmost brilliancy. The ceiling of the grill will be divided into three large bays, each having

its own indirect color-change lighting. A balustrade surrounding the main portion of the grill and slightly raised above the dance floor level, is formed of silver bronze and glass panels which are sandblasted and etched. It is illuminated by the color-change lights through the bottom of the glass which catches all the relief of the etching. By means of reflectors, this light also is thrown horizontally across the dance floor, illuminating the feet of the dancers. The "Queen Mary" is scheduled to sail May 27 on her maiden voyage to the United States.

### Skis on Auto's Front Wheels

#### 7144 Aid Steering in Snow

To make steering easier in snow, an English entrant in the Monte Carlo trials attached skis to the front wheels of his automobile. In soft snow, the front wheels sink so deep that steering becomes difficult and the driver tires rapidly from fighting the wheel. The skis slide smoothly over the snow and the weight of the car helps to prevent the front end from skidding on turns.



Runner attached to front wheel of car, ready for start of Monte Carlo trials

Cum gratia White  
Star Line







# Plane Spans U. S. at Four Miles per Minute



Two views of the slim, racy monoplane in which Howard Hughes set a new coast-to-coast speed record

*Northrop Airplane Co*  
 an hour. The plane, a Northrop Gamma, with constant speed propeller, carried 700 gallons of fuel and had 100 to spare at the finish. The radial motor develops 925 horsepower at sea-level and a supercharger maintains high power at high altitudes.

## Power from Wind Generator Is Limited at High Speeds



Driven by a wind wheel connected directly to the shaft, a direct-current gener-

*but*  
 Hurtling through the sky from Burbank, Calif., to Newark, N. J., at better than four miles a minute, without a stop, brings fame to Howard Hughes—movie producer and speed pilot—as the new holder of the transcontinental flight record. Trying out new type Wright engine in his low-wing, slender monoplane he lifted the ship off the west coast airport shortly after noon, picked a lane 18,000 feet high and in nine hours, twenty-seven minutes and ten seconds set the wheels down on the Newark runway. His record beat that of Col. Roscoe Turner by more than a half hour. Hughes already held a record for land planes of above 352 miles an hour, set on a three-kilometer course. He averaged nearly 260 miles an hour for the 2,450-mile transcontinental jump and covered the Indianapolis-Columbus sector at 295 miles

*Another plane—special 1,000 hp. racing monoplane (says reader)*

*with 1,000 hp. engine*

*20 ft. 1000 hp. engine*



Auto Power. due.  
408 of Hyne Ave  
Chicago

ator built entirely of aluminum except for the field and armature is now on the market. The coils are so wound that regardless of the speed above 400 revolutions per minute, only one kilowatt is developed. It will close the cutout on a thirty-two volt plant at 175 revolutions per minute, charges five amperes at 200 revolutions and develops one kilowatt at 400 revolutions. Wind resistance is minimized by streamlining. The generator is available in various power capacities.

### Lighted Moon Clock Shows Next Phase

Which phase the moon will assume on the following night is shown by an unusual clock installed recently on a church steeple in a Berlin suburb. The clock is a large lighted globe with shaded sections to indicate the proper phase for any time during the month. Above it is a larger clock for telling time.



White spot below clock is moon indicator

### Milk Kept Fresh for Months by Steam-Vacuum Capping



Capping machine as it applied metal sealer to bottles for keeping milk fresh over long periods

Milk can be kept sweet for several months by passing it, after pasteurization, through a bottle capping machine. The capping chamber is filled with dry steam, which creates a vacuum and sterilizes the surface of the milk. A metal vacuum cap seals the bottle. Kept in a refrigerator, the milk will remain unchanged for three months. Untreated milk changes even in an ice chamber.

### Cabbage That Doesn't Smell Is Developed for Market

Odorless cabbages will be ready for your table soon. Six years' work at Cornell University went into the production of a variety of cabbage without a smell, and at last, after careful pollenization with tweezers for many generations of cabbage plants the odor was eliminated by hereditary selection. The chosen seed are being guarded against contamination and within two years it is expected enough of the odorless plants will be grown to go on the market commercially.

White Cap Co Central Ave  
1812 N. Chicago  
Prof. C. H. Meyer  
at Siemenstadt  
Althaca, N.Y.



61432  
Cm. Bob Duskau  
1239 Appleton St.  
Long Beach, Calif.

More Garden

are also "non-poison" cucumbers, with the objectionable flavor removed. These can be eaten, skin and all, like an apple. The bush pumpkin, as the name implies, grows upward as a bush, with the pumpkins forming in the center.

In his "gritless" spinach the characteristic harsh flavor is removed. The entire plant, including stalk and leaves, is fiberless, tender and edible. Where winters are mild it can be grown the year round. There is also the

MAN is only beginning to solve the mysteries of plant life. We grow on acres what could be grown in square feet of ground through processes of selection, and sturdier stock could be developed to withstand many of nature's onslaughts. The time is coming when, in his back yard, the amateur gardener will be able to grow, the year round, sufficient produce to feed his family.

"The trend to individual, Lilliputian gardens is inevitable," says Major Harry L. Bateson, plant wizard of Long Beach, Calif., who has developed vegetable and flower species which have earned him wide recognition.

Achievements of Major Bateson include a "dwarf bush corn" comprising multiple stocks growing from a single root, with as many as twenty ears maturing at once. Maximum height is about three feet. There

Rare type of tuberous-rooted, hot-house begonia, and dwarf corn developed by crossbreeding. Several ears mature at once





E 1432

# *in* LESS SPACE



*Bed of zinnias developed in thirty years from blossoms the size of a dime, brought by Major Bateson from Mexico*

cabbage-cauliflower which develops as a cabbage, then continues growing until the head has turned to cauliflower.

"Plant 'wizardry' is a process of development and not creation, involving a constant search for throw-backs," says Bateson. "Nature creates black-sheep, misfits, plants with hereditary ailments—or super-plants—all from otherwise normal families. We select the strong, or the individualists, and blend them with the hardiest or most unusual, in the families we know."

Why, for instance, should onions have an odor unlike lilies of which the onion is really the parent? The first step was to find two onions of the same species which were virtually taintless, mate them, and in succession take seeds from the mildest of the offspring. The result of thirty-five

years of effort is a partly odorless onion about ninety per cent developed; that is, ninety odorless out of every 100.

Likewise, acid in tomatoes—an unessential. In certain types of tomatoes Bateson found almost no acidity. Again it was a process of selection and breeding. He also found tomatoes could be grown in clusters and that it was unnecessary to grow fruit with the high water content. The result is an acidless tomato, scarcely larger in circumference than a quarter, and which contains food equal to the ordinary type.

"Nature did so much that man has unwittingly been taking it easy," says Major Bateson. "For instance, she gave us the bee. And for thousands of years the bee has been 'half-doing' work in pollenization that we ought to have done scientifically."



799  
 518  
 11. dis  
 Four Motors Drive Big Seaplane over Ocean  
 Lt. de Vaisseau Paris.  
 785

# Four Motors Drive Big Seaplane over Ocean



French flying boat is shown on Pensacola (Fla.) bay where it landed after crossing the Atlantic from Paris. Not long after this photo was made, the plane was damaged when a sudden squall upset it

Marking the 300th year of French rule in the western hemisphere, a giant flying boat recently completed an air voyage from Paris to Pensacola, Fla., by way of Dakar, Senegal, Natal, Brazil and Mar-

tinique, in the French West Indies. ~~Four~~ motors drove the seaplane across the sea to a triumphant landing on Pensacola bay. The craft is one of the largest in the French air fleet.

## Eskimo Sledges Are Lashed with Thongs of Walrus Skin

Eskimos scorn nails in lashing together the runners of their sledges. Sleds built

with nails would be likely to break in the rough going along hummocky shore ice.



Cross-boards are lashed to runners with walrus strips instead of nails

Instead they lash the transversal boards, which form the top, to the runners with tough thongs made from strips of walrus skin. The small cross-boards, laid every two or three inches along the top of the runners, are grooved so that the walrus strips will not slip off. Holes are drilled for the thongs near the top of the runners. When the sledge is driven over irregular, rough blocks of ice these thongs give enough to absorb the shock and save the sledge from breaking apart. The line running along the edge of the runners affords a way of lashing baggage to the

Cont. Lses H. Valiquette  
 293 Esquimaux Ave.  
 Attawapiskat, Canada



*Service*  
*1/15/36*

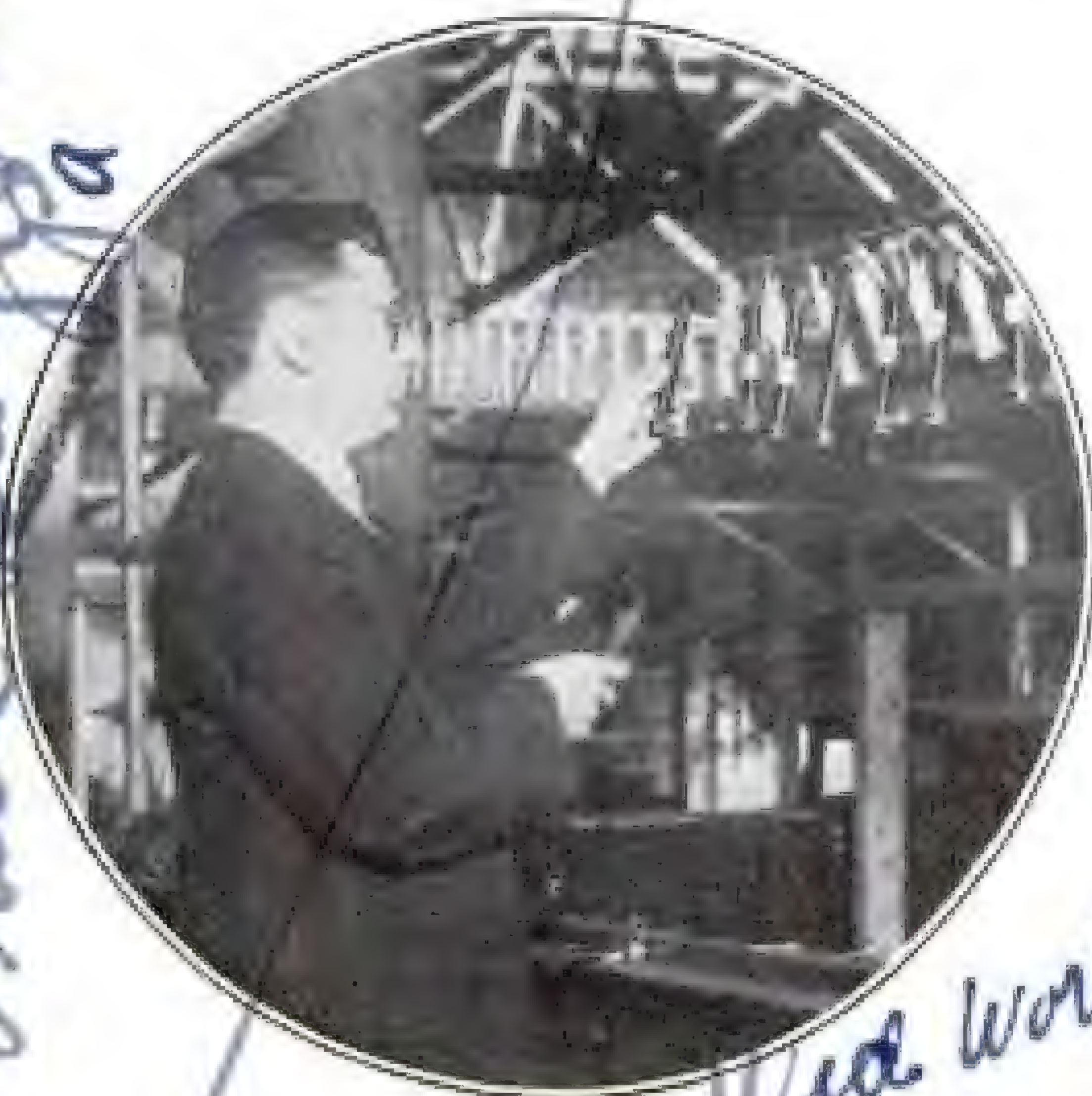
sledge. Repairs along the trail are more easily effected with thongs than with nails.

### "Fingerprints" of Auto Tires Help to Trace Criminals

Modern counterpart of the pioneer woodsmen who tracked their quarry by footprints in mud or snow are the federal "G" men, who trail criminals sometimes by the "fingerprints" of their automobile tires. In a file at Washington are 1,800 different tire patterns. When a criminal's car leaves its tire marks on paved highway or mud road, law enforcement officers photograph the marks or make plastic molds of them, compare the patterns with their files, and not only determine the make of tire but from its markings identify the car as it appears elsewhere.

### Weights Hung on Model Cable Test Strength of Bridge

As the San Francisco-Oakland bay bridge is being erected, engineers are constantly checking for stresses and strains by hanging weights on a single strand of cable representing the cables of the real bridge. White weights are hung on the "line" to represent the actual weight of the cable in miniature; the black cylinders designate road sections in place, and as the road is completed the effect on the cables is watched by adding black weights.



Hanging black cylinders on model cable to represent weight of road sections on bridge

### Foot Circulation Improved by Roughened Cylinders



Trying out the blood stimulator invented to relieve tired feeling in the feet

Rubbing the soles of the feet on the roughened surfaces of a cylindrical device introduced recently on the west coast will speed up the blood circulation. The circulator has a wartlike surface on each of its two cylinders or spindles and the feet are rubbed back and forth to stimulate the flow of blood. The treatment is said to relieve fatigue for persons who stand for long periods and for those subject to cold feet, the result of poor circulation.

Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information is kept on file and will be furnished by our Bureau of Information upon request, accompanied by stamped, self-addressed envelope.

*H. W. Trolsch,*  
*Armenian Bridge Co.*

*December 3, 1935*  
*Dr. Oakland Calif*  
*Fred J. Degeant*



6 1544

Chicago Fire Department School  
Cape M. & more



# Mystery FIRES



self-heating of combustible materials to the point where they burst aflame—costs this country perhaps \$50,000,000 a year in fire losses; and static electricity—that spark at your fingertips after you glide across the parlor rug—is lurking everywhere as the unseen torch that may start a holocaust.

A series of fires in an eastern shoe factory puzzled officials of the plant one winter. Always, the flames broke out at the same point, and always the same girl employe was at the worktable, passing shoe soles between rollers where rubber cement was applied



**Y**OU don't need a can of gasoline and a box of matches to burn the house down. You can do it with a goldfish bowl, a carpet sweeper, a sack of sugar or an insect spray. An umbrella handle or an electric-light bulb may set the house afire, or you may discover you're a human spark plug yourself.

If you smoke a cigarette in bed, toss a can of kerosene on the kitchen stove or let the youngsters play with matches you can only blame yourself for adding to the total of 10,000 deaths caused every year by fire. But how can you help it if the blaze was self-started? Spontaneous ignition—



In training at a firemen's school, these fighters will be ready for duty when the sun shines through a goldfish bowl and starts a blaze or the drapery is set aflame by a cigarette

Chicago Fire Department School



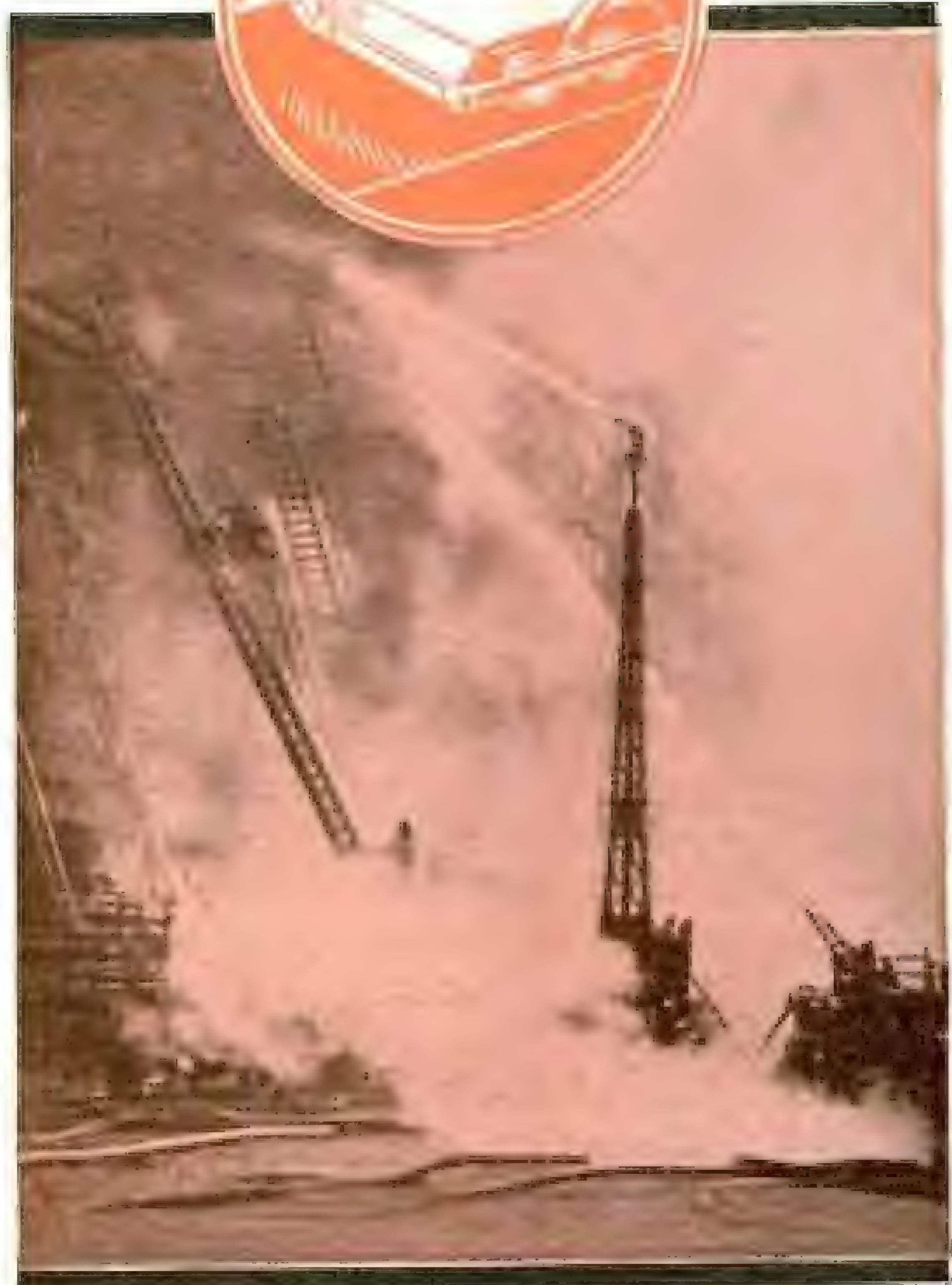
Engine no. 11.- Last run  
from 10 E. Austin. \$154.4

# and HOW they START



to the leather. Suddenly and mysteriously the rubber cement would burst into a blaze. Obviously the girl was not guilty of arson; in fact, on one occasion she was severely burned. During her absence a substitute worked regularly at the same post, yet no fire occurred. Then, fifteen minutes after the girl returned to duty, another fire started. Physical examination demonstrated that her skin was so dry that static electricity was continually building up a strong charge in her body and clothing, and sparks from her fingertips would ignite the rubber cement. She was a human spark plug. Maybe it's fun to "shock" your friends with a static spark from your finger, but if conditions are just right you may blow up the house.

A painter was burned to death when a spark, either static or from an electrical appliance, touched off the inflammable vapor rising from his varnish remover. Even



Old and new in fire fighting equipment—horse-drawn fire engine starting for blaze, and a modern water tower in action

Threlkeld  
and Son Boston





*Firemen wearing oxygen masks and helmets insulated against electricity rescue victim overcome by smoke. Battery of floodlights at right guides squads at night fires*

an insect spray can be an agent of flaming death. A housewife was spraying crannies with a liquid insecticide when a spark caught it, the home burned down and she was trapped in it. There is enough friction in the flow of a liquid to generate a dangerous charge of static, and merely pouring gasoline from one metal container into another might cause an explosion if care is not taken to keep the two containers in contact to disperse the static. That is why filling-station attendants keep the fuel hose, made of non-ferrous metal, touching the car as they fill your automobile tank, and gasoline tank wagons drag a chain to ground the static developed by the fluid. One of the simplest methods of starting a blaze you can't stop is to use gasoline, naphtha or similar highly volatile substance to clean a suit or gown.

Gasoline vapor is dangerous farther than you can smell it. Light a cigarette in the next room and the flame will follow

that odor of gasoline to its source. A tiny pilot light in the kitchen may touch it off. But if that doesn't happen, just rub the cloth a couple of times and it will generate—particularly if it is silk—enough static for a spark that will ignite your cleaning fluid with a murderous flare. Static electricity in a cloth type dust-collector once caused a dust explosion that wrecked part of a factory and seriously injured six men.

But for subtle ways of starting fires, consider spontaneous combustion. Com-

monest victim of the self-starting blaze is the hay barn. Hay, stored away too green, has a way of heating up in damp spots to the point where a breath of air fans it into flame. Spontaneous ignition destroys hay worth \$20,000,000 each year, and one-tenth of the entire harvested hay crop of the United States, worth \$1,300,000,000, is destroyed by spontaneous heat that chars without quite reaching the blazing point. All this loss despite the fact that farmers have recognized this heating process for two thousand years or more.

Floods in Vermont were followed by an epidemic of barn fires. As soon as the water receded, haymows began to heat. One barn standing in five feet of water caught fire two days after the flood crest passed and burned to the water line. Four hundred barns burned in three years in the province of Ontario and half of them were due to spontaneous combustion.

You reflect, comfortably, that this does





not concern you for there is no hay stored in your home. How about that pair of greasy overalls hanging in your closet or those rags you used to wipe the paint brushes, then tossed in a burlap rubbish bag? Anything bearing a trace of vegetable oil, which oxidizes and creates heat, is a fire menace. Linseed oil is a notorious incendiary. What about your carpet sweeper? Minute particles of floor wax and other combustibles mingle in the dust collector of one carpet sweeper under just the right conditions to heat up and set the house afire.

Several fires have started spontaneously in jute bags of sugar. Disastrous theater and hospital fires have been traced to spontaneous ignition of cellulose-nitrate motion-picture or X-ray film, which decomposes at a temperature of 300 degrees Fahrenheit and ignites easily even in a low air supply, giving off noxious gases. Certain cleaning compounds, silk stored away in improper conditions, and sawdust heaps are breeders of flame. Wood that has been alternately wet and dried absorbs a heavy



Top, fireboats at waterfront conflagration. Below, operator plugs switchboard and light on map shows location of fire

supply of oxygen and ignites readily, even at low temperatures. You're courting fire if you pack your steam lines with sawdust.

Modern fire departments date back only to about 1865, when cities of America and Europe assumed the duty of protecting the homes. The Roman, Crassus, added to

(Continued to page 148A)

Chas. Tanker at, Baginre  
N.J.  
E 1544

Los Angeles  
6017



## Shockproof Compass Built for 'Queen Mary'



Stitching compass points on silk. Right, finishing shockproof pedestal for "Queen Mary's" compass

Expert needlewomen at Glasgow, Scotland, have an important part in building the magnetic compass, one of the largest in the world, which will guide the liner "Queen Mary" across the Atlantic on her maiden trip. These women stitch in bright colors, with finest silk, the points of the compass which must stand out in bold relief and with unerring accuracy on the compass card. Despite the modern inventions of the gyroscopic compass, "metal mike" and submarine echo-sounder, the old-fashioned magnetic compass that

Christopher Columbus relied on is still the vital element in steering ocean vessels. The "Queen Mary's" compass has the coach-spring form of suspension fitted into the pedestal. The compass card is poised on a pivot whose base is fixed on a mattress suspension to absorb shocks.



## 'Hitching Posts' for Clipper Ships Are Old Boat Anchors



Modern air liners will be "hitched" to these old anchors which were discarded after long service on ocean-going boats

Rusty anchors of old ships, bought at scrap iron prices, are to be put to modern use at the island bases in the Pacific where ocean air liners will stop for refueling and servicing. They will anchor the buoys to which the clipper ships will be moored while making the regular service stops on the transpacific air route.

*Pan American Airway*  
Best Gasoline Will Win War of Future, Says Scientist

Dr. Merrell R. Fenske of Pennsylvania State College says that the next war will be won by the nation having the best gasoline. The load which a bombing plane can carry and the range of a pursuit plane depend upon the weight of gasoline they

*State College Pa*



Science Service  
1/20/36.

*F68*  
**Three-Pound Portable Radio  
Transmits Voice Two Miles**



Mouthpiece doubles as receiver for this tiny two-way radio set. Battery and all, compactly boxed, weigh only three pounds

must transport, Dr. Fenske says, and if the efficiency of gasoline could be improved so a gallon of fuel would give more miles of flight than at present, then the bombing plane could carry a greater load and the pursuit plane would have a greater cruising range. The efficiency of the modern gasoline engine depends on the compression ratio. However, as the compression ratio is increased to get efficiency, "knocking" appears unless the octane rating of the fuel is increased. The government last year ordered 1,000,000 gallons of gasoline for army and navy planes with an octane rating of ninety-two. Automobile gasoline has an octane rating between seventy and eighty.

*F104*  
**Three-Foot Collar for Fido  
Protects His Sore Tail**

When your dog has a sore tail, tie up his neck. That's part of the treatment at an animal hospital in California where dogs with sore tails wear collars consisting of light plywood disks three feet in diameter. The collar helps heal Fido's tail because it prevents Fido from biting it.



Here is collar Fido wears to help speed up healing treatment of his tail

In a small box conveniently equipped with shoulder straps, a Staten Island inventor has built a radio transmitter and receiver capable of carrying the voice and receiving for a distance of two miles. Completely equipped, with power supply self-contained, the outfit weighs just three pounds. It operates on a frequency of sixty megacycles. A single-unit mouthpiece and receiver is used.

*F53*  
**Plant Grows Bigger If "Stuffed"  
with Carbon Dioxide**

Plants can be made to grow bigger and produce a larger seed yield by "stuffing" them with carbon dioxide, the atmospheric gas they use as initial raw material in food-making. This is the finding of Dr. Earl S. Johnston of the Smithsonian Institution after a series of laboratory experiments in which he grew wheat plants in open-topped glass enclosures, maintaining the carbon-dioxide content of the air at four times the usual percentage. The plants produced more stalk and larger and more numerous heads than did similar ones in adjoining containers where only ordinary air was used. As yet the results have no practical application because the cost of raising the carbon-dioxide content of the air under field conditions is greater than the worth of the increased yield.

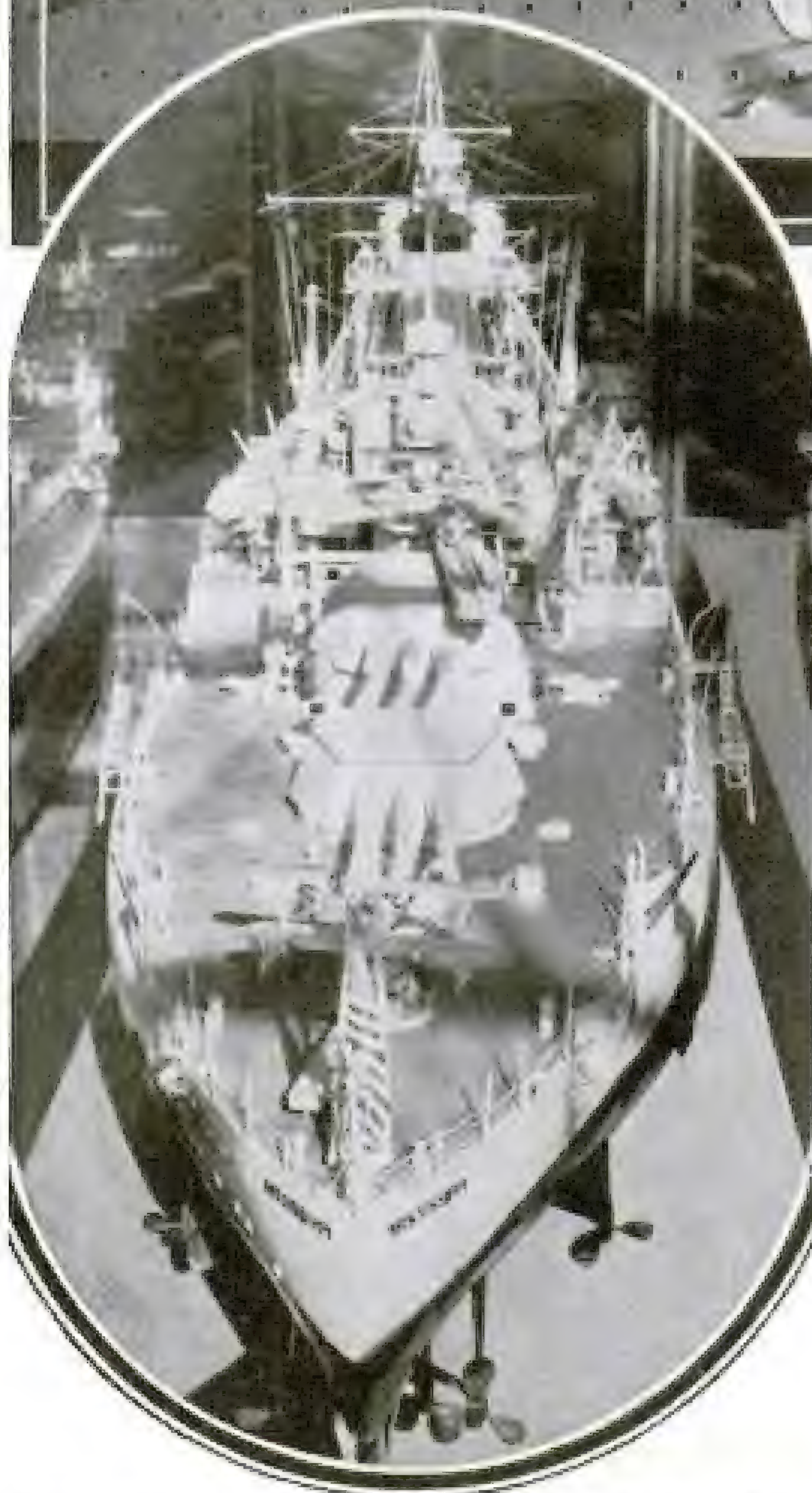
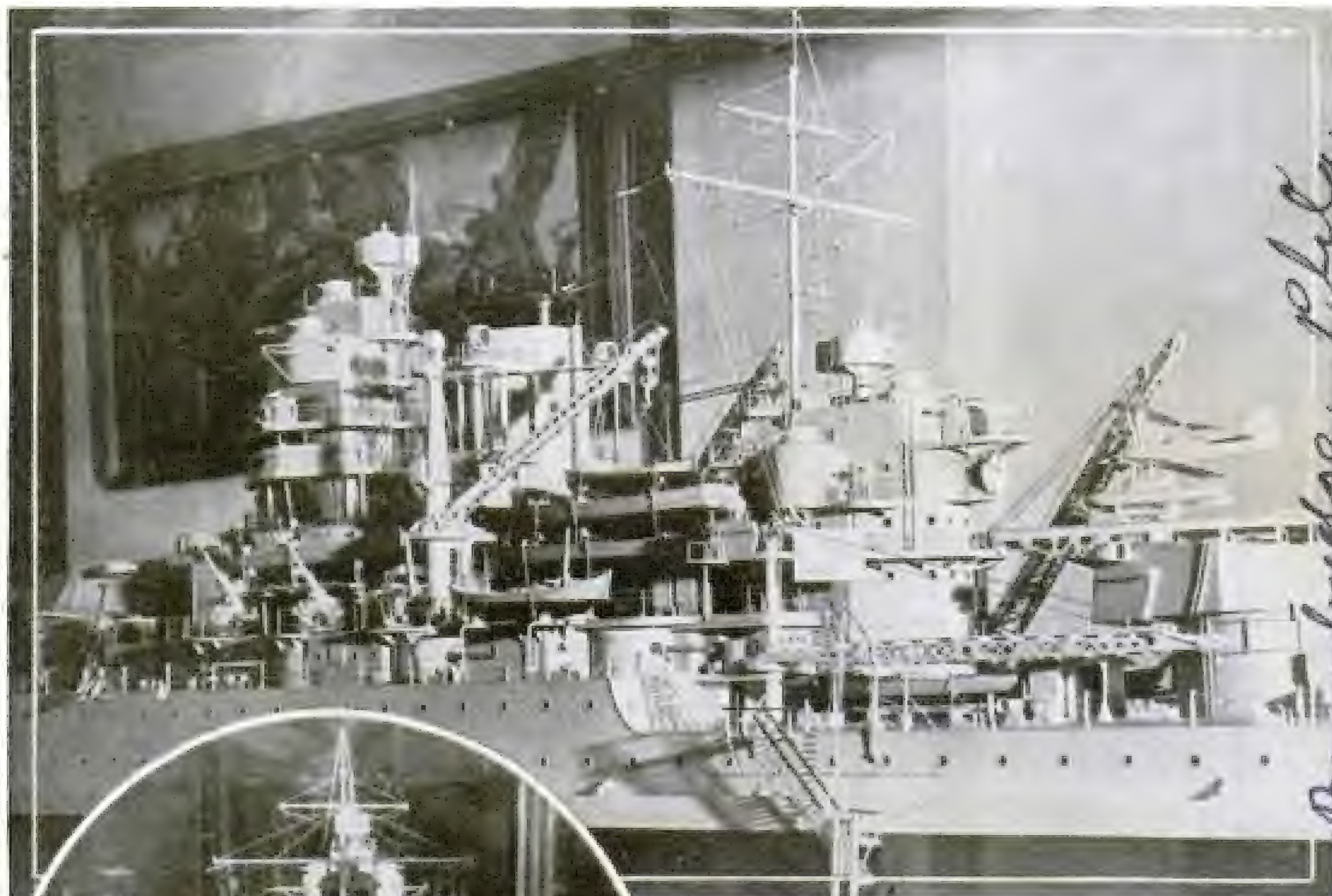
*Charles Allestree  
156 Bryant Ave.*

*Science Service 1/20/36*

*Washington, D.C.*



# 'Mississippi' Is Navy's Only Battleship Model



Stern and side views of navy's model of the U.S.S. "Mississippi," with seaplanes on deck catapults

© Harris and Ewing

Only model of a great modern battleship in the navy's possession is that of the U.S.S. "Mississippi," now on exhibit at Washington. It was built by F. B. Craven of LaPorte, Ind., at a cost of \$3,975 and is true to every detail of the dreadnaught itself. Even toy seaplanes are shown mounted on catapults on the afterdeck. One other model owned by the navy is of a cruiser, the U.S.S. "Houston."

## One-Station Radio Receiver F57 Assures an Audience

One of the simplest radio sets recently developed is a one-station outfit. It is tuned by the manufacturer to a certain wave length, the volume is fixed, and the only adjustment is the switch that turns it on and off. Such an outfit is quite inexpensive to build. By placing these sets in stores and places where people gather, the radio station to which it is tuned can assure itself a large audience. The one-station set can also be connected with a clock that turns the radio on automatically during a certain advertiser's program.

Ivan Kreemef. %  
J.A. Bartholmew

Philadelphia, Pa.  
American

Adams



21507

220 Cairg St  
Washington  
Station  
Pittsburgh  
Pa

# MASTERPIECES in Wax

By J. A. Hogle, Jr.

"MEXICO, the land of contrasts," is also the home of unusual art—the application of odd materials to native handicrafts.

Dolls and animal figures are made from cornhusk and bits of wood, Mexican landscapes, street scenes and native life are portrayed in clever mosaics of colored broomstraws or "popote," and reproductions of native life formed in statues of wax!

The wax statues portray, in miniature, the everyday life of the natives, women making tortillas, pottery makers, basket weavers, fruit and produce vendors and bullfighters in their elaborate costumes. Interesting figures are those of the charros and the china poblanas, the colorfully costumed Mexican cowboy and cowgirl mounted on beautiful horses in various colors and lifelike postures. The saddle, stirrups and



trappings of these statues are complete to the smallest detail as are the costumes of the riders.

Luis and Ramon Hidalgo, Mexico's wax sculptors, are descendants of Joaquin Hidalgo, famous wax sculptor, who brought the art to Mexico from Italy and Spain in 1777. It has been handed down through seven generations.

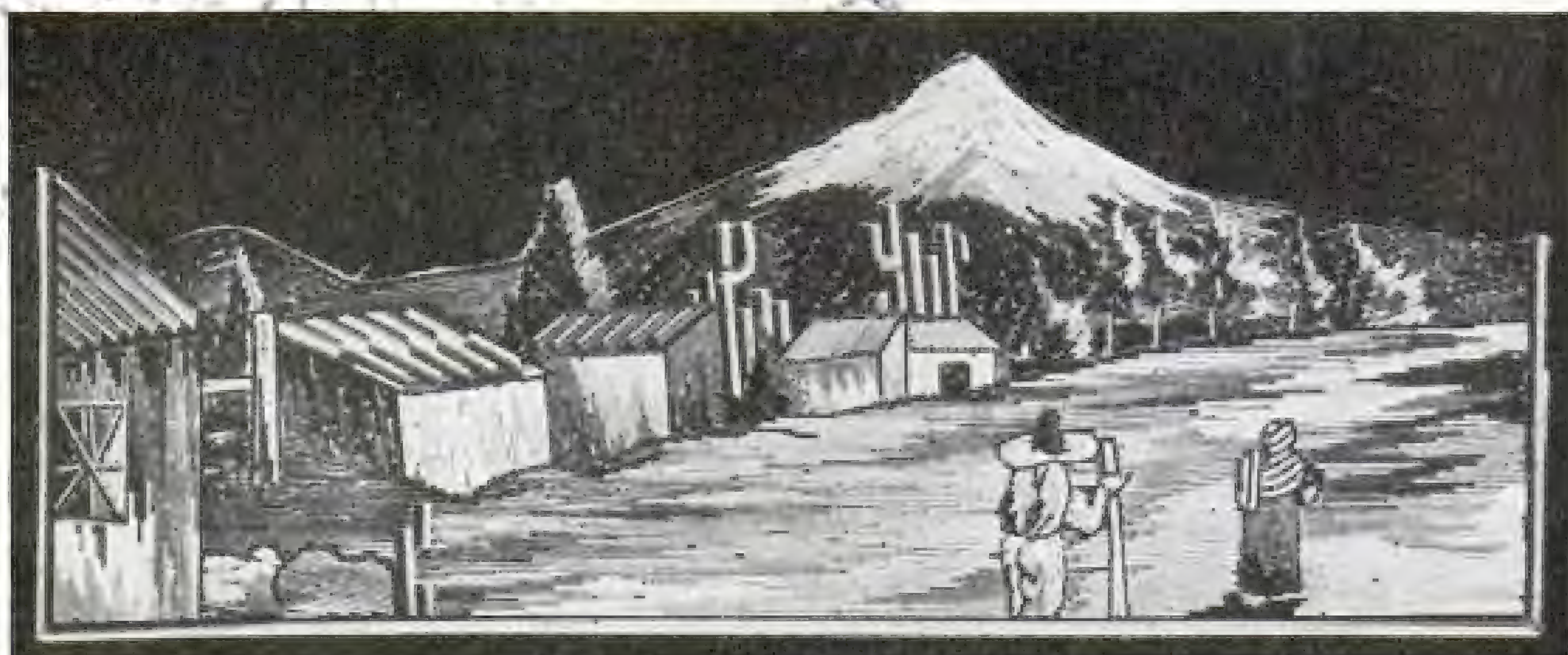
Ramon employs molds in making some of his reproductions and incorporates bits of other materials such as cloth, leather and tinfoil, but Luis Hidalgo, famous throughout the continent for his reproductions in caricature of famous personages uses nothing but his fingers to shape the wax. He not only has inherited the secrets of his ancestors but has worked out many new methods in the coloring and preparation of the wax,

Luis Hidalgo, one of two brothers famed as Mexican wax sculptors. Center, dancing girl done in wax by Hidalgo. Bottom, wax grouping complete to smallest details

Wax Sculptor  
City, D. C.  
Mexico  
Filomena Mate  
No. 17



61507  
528



*Top, picture made of hundreds of colored broomstraws. Below, Mexican feather composition*

one of the most important improvements being a wax that will withstand a high temperature.

The broomstraw artists are mostly girls and young women whose ancestors, in many cases, were Aztec Indians famed for making feather mosaics. The adobe hut of the native serves both as home and studio.

Here, with a tray of colored broomstraws or popote and a pair of tweezers, they glue broomstraws of various lengths and colors on cardboard to form landscapes and portraits that resemble oil paintings in shading and perspective. The broomstraws used for picture making are grown near the volcanoes, Popocatepetl and Ixtacihuatl some distance from Mexico City. Nature not only supplies the material for this unusual art but has surrounded the artists with a panorama of wondrous beauty. This scenery forms the background in most of their pictures. Church towers, street scenes and neighbors at work are favorite subjects.

Popote pictures range from the size of a postage stamp to about eight by ten inches or larger. Some compositions require thousands of tiny lengths of straws and a week or more is needed to complete some of the more elaborate pictures which sell for from \$5.00 to \$7.00. Most curio stores in Mexico City will have your favorite Mexican snapshot copied in broomstraws for a nominal sum. Wooden fruit bowls and serving trays inlaid with popote pictures, as well as jewel and powder boxes, also can be purchased. Most popote pictures are sold unframed but they are also available with frames decorated with inlays of the same material. Picture making with broomstraws apparently is not one of the old Aztec arts but dates back to about 1850.

Feather mosaics of multi-colored birds formed on cardboard of various sizes, when framed, make a handsome wall decoration for the home. Greeting cards dec-



61507

PULAR MECHANICS

529

## Cableway Drops Freight Car to Rails below Boulder Dam

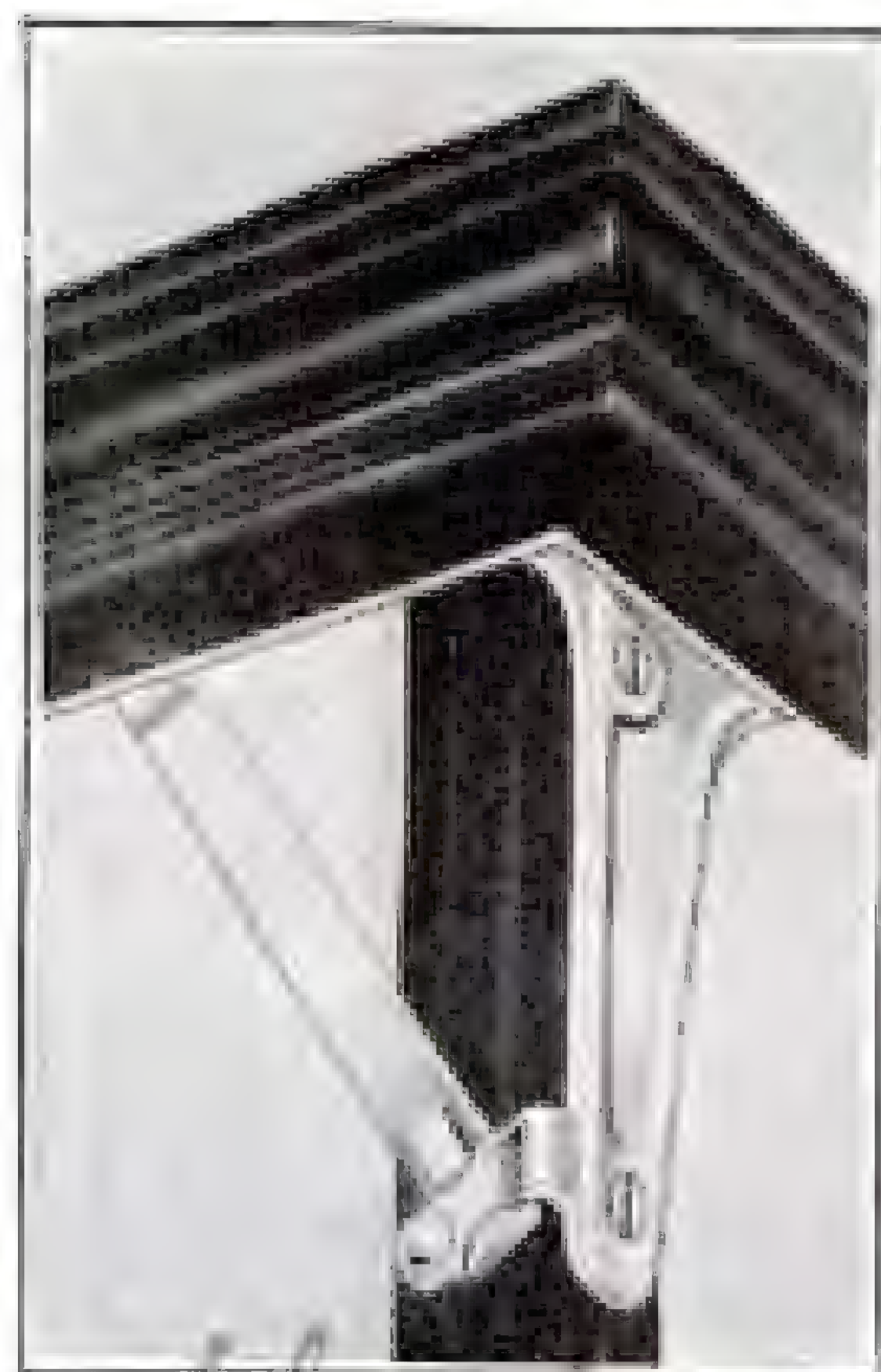


Loaded freight car swings out over canyon on cableway and drops 800 feet to rails leading to Boulder Dam power plant

orated with feather mosaics and further enhanced with hand-painted flowers offer a change from the usual. Score cards for bridge parties are another item obtainable with feather-picture decorations.

Feather mosaics date back to the days before the conquest when artisans were expert in the creation of real works of art with the feathers of tropical birds. These birds, mostly of the parrot family, furnished gorgeous feathers of every hue and texture. The downy feathers of the hummingbird were also used in profusion in the creation of draperies and wall decorations and feathers were pasted on fine cotton web and made into dresses for members of the wealthy families. Aztec nobles and high officers of the various military orders wore coats of feather work over their quilted armor. These coats worn with plumed helmets gave them a picturesque appearance and banners, embroidered in gold and feather work and decorated with gayly colored plumes, added splendor to military assemblages. History records that when Cortez and his followers first visited Montezuma at his palace, they passed through rooms, the walls of which were hung with gorgeous draperies of feather work wrought in imitation of birds, insects and flowers.

## Brace for Legs of Card Table Is Locked in Position



Foolproof leg braces for the card table are handy in repairing and strengthening these and other pieces of collapsible furniture. The braces lock in position when the legs are opened, but lay flat and out of the way when they are folded.

## Homing Pigeons Carry "S O S" from Fishermen to Shore

Long Island fishermen are taking on homing pigeons as their partners. Two pigeons ride along as passengers in every fishing boat that puts out from Freeport, L. I. From the fishing grounds, the first bird is released with a message to shore advising other fishermen of their location and their luck with the catch. A second pigeon is kept as an emergency "ship-to-shore" messenger, to carry an "S O S" message in a capsule in case of trouble.

The Stanley Works  
 195 Lake St.  
 New Britain, Conn.

Carl George H. Eckhardt  
 2047 N. Park Ave.



81459

# The NEXT WAR



U. S. army searchlights throwing 100-mile beam. In front of lights are sound detectors which pick up whir of airplane propeller and enable the soldiers to turn beam on "enemy" aircraft

Hartford  
Conn.

By Hiram Percy Maxim *ded*  
(Noted Inventor, Author and Engineer)

Feb. 17, 1936

## PART IV

**I**N THE next great war men will battle in a new medium—the ether. Tremendous strides have been made since the last great war in exploring this strange and little understood domain.

Originally, in our efforts to account for the transmission of light across space, we had difficulty understanding how light waves could be propagated unless there were some medium which would carry waves. We understood sound waves in air and knew they were propagated in the air. We understood water waves because we could see them propagated. But when it came to light waves, coming across millions of

miles of empty space, we were stumped. To propagate a light wave it seemed something were needed that could be waved.

Empty space being without a wave-carrying medium, we decided to imagine one. We imagined an all pervading something so finely divided that it passed through everything without friction. It was supposed to be perfectly elastic and jellylike. Such things as suns, planets and moons could travel through it at high velocities without resistance. Light, as well as all other forms of radiation, set it vibrating or oscillating. These vibrations oscillated sidewise instead of forward and

*[Handwritten notes and signatures at the bottom of the page]*



# *in the* ETHER

backward as sound waves oscillate. Light waves traveled through this mysterious substance at a velocity of 186,000 miles per second.

This theory called for large applications of faith. A frictionless, perfectly elastic jelly, that permitted all these things to happen, taxed credibility. But something had to be provided to account for what was known to happen. Pending the offering of a better theory, it was accepted by the scientific world and the assumed substance was given the name ether. Then Dr. Albert Einstein came along. He suggested we cease trying to imagine an all pervading mechanistic medium, and instead, urged us to regard the propagation of radiation as an abstract mathematical concept, such for example as the "propaga-



*Top, unusual view of mainmast of U.S.S. "Pensacola." Bottom, cruiser "Cincinnati" pouring out dense smoke screen to hide activities of airplane carrying ship, "Lexington," in Pacific maneuvers*





tion" of solar noon around the earth at the equator.

The equator is an abstraction, but solar noon is propagated all the way around it every day. Einstein further playfully suggested that each of us imagine our own ether, and so have what suited us individually as best accounting for the propagation of radiation. Here we have the existing state of affairs regarding the ether, the greatest myth of science.

There is only one ether. All our radio communication, friendly and enemy, must be conducted in it. In the next great war there will be armies of millions of men. Maneuvering these vast numbers will de-

mand thousands of radio transmitters and receivers.

There will be naval fleets each numbering hundreds of ships. To maneuver and fight them effectively will require more hundreds of radio sets. There will be thousands of airplanes, most of them transmitting scouting reports and receiving orders. There will be at least 100 submarines which will need frequent communication with their headquarters. There will be hundreds of non-combatant ships accompanying the fleets, furnishing transport, material, supplies, hospitalization and equipment. They will require radio communication.



*Top of page, Japanese destroyer, "Tsuta," anchored at Tientsin, China, at one point in crisis between the two nations. Bottom, German torpedo boat bucking high seas during maneuvers in North Sea*





*Above, cavalry officer in U. S. army mechanized unit receiving orders by radio as he prepares his steel steed for action*



*Top, right, camouflaged Vickers instrument which controls fire of anti-aircraft guns. Bottom, signal corps company of U. S. army sets up communications equipment during war games*





*Troops mounted on horses and automobiles camouflaged with foliage are shown being moved at midnight during the annual grand maneuvers of the Japanese army at Kagoshima*

Imagine thousands of steam whistles tooting, fire-alarm bells clanging, traffic sirens screaming, automobile horns hooting, and radio loud-speakers blaring. While you, in the midst of it all, try to make out what is being said by one of the fainter loud-speakers. And yet, in the next world war, radio sets must successfully pick out and make intelligible what each wave is saying.

This can only be done by tuning, or rejecting all except the one wave desired. The ether, a tumult of different waves emitted by thousands of transmitters, is like the confusion water is in when a large number of boats are passing to and fro. To pick out one particular small set of waves, and reject every other, seems an utter impossibility. Fortunately we cannot see the confusion of waves in the ether as we can on water or we would quail at the job of picking out a particular one. But it can be done.

By immersing a wire in this confusion of ether waves, we find the wire will pick up that series of waves which is "in step" with the particular "step" natural to the wire. If the natural step, or period of elec-

trical oscillation, of the wire is 30,000,000 per second, only that many waves per second will excite the wire. Any other number will leave it "cold."

If some one station is transmitting at this particular frequency, its signals will be heard, and all other frequencies will be rejected. However, if more than one station is transmitting at this exact frequency, all will be heard, and an unintelligible jumble will result. This is why, when several transmitters are sending out waves, each transmitter must have a wave length, or frequency of its own.

Several armies, with several millions of men in each, scattered over a front a hundred or more miles long, divided up into many separate mobile units, call for the extreme in coordination. The next great war probably will see the most far-reaching system of coordination ever attempted, because more men and speedier equipment will be involved than ever before. Without radio communication the difficulties would be insurmountable.

To conduct the communications of several allied armies, not to consider enemy armies, requires the use of a large number



of different frequencies. There are available waves from one meter to 30,000 meters for both radiotelegraph and radiotelephone. The distance from crest to crest of a one-meter wave is one meter, or about thirty-three inches. The distance from crest to crest of a 30,000-meter wave is 30,000 meters, or a little over eighteen miles.

These waves radiate from a transmitting antenna at the velocity of light. In the case of one-meter waves, a "punch" is delivered to the ether frequently enough for the resulting wave of ether to move out just one meter by the time the second punch is administered. Since the waves move out at 186,000 miles per second, the "punches" must come pretty frequently. If we wait even



Top, directing air fleet from ground by using radio. Bottom, Berlin street cleaners in gas masks after realistic air "raid" on the city

one second between punches, wave No. 1 would have reached a point 186,000 miles away before No. 2 started. The distance between waves then would be 186,000 miles instead of thirty-three inches. To deliver a new punch by the time the wave from the preceding punch has traveled outward only thirty-three inches, requires that punches follow each other at a frequency of 300,000,000 per second. If the

wave length is 30,000 meters, the frequency of the punches must be 10,000 per second.

During the world war we did not know how to administer 300,000,000 punches per second. The best we could do was about 1,500,000. The difficulty was keeping the number of punches per second exactly at one steady rate. Today, thanks to crystal control, we can hold our punches steadily



61459  
536



*Top, camouflaged heavy field gun in action during Japanese maneuvers. Bottom, Japanese soldiers wearing fish nets to which may be attached branches, twigs and grass for camouflage in the field*

enough at 30,000,000 per second to give reliable communication. This is ten-meter wave lengths.

Below ten meters new troubles arise. Roughly speaking, physical objects, such as mountains, become opaque, as is the case with visible light waves. To ether waves of ten meters or longer, mountains, buildings and similar objects are transparent. To waves below ten meters they are opaque. Reliable communication on these ultra-short waves is therefore limited to "line of vision."

Visible light waves are ether waves, like radio waves. The only difference is that there are more of them per second. The lowest ether wave frequency our eyes can detect is thirty-seven and one-half million

million per second. This is the darkest visible red. The highest frequency our eyes can detect is 150 million million per second. This is the faintest shade of violet. The vast space between the slowest of visible light and the fastest of radio waves indicates the extent of this unexplored realm.

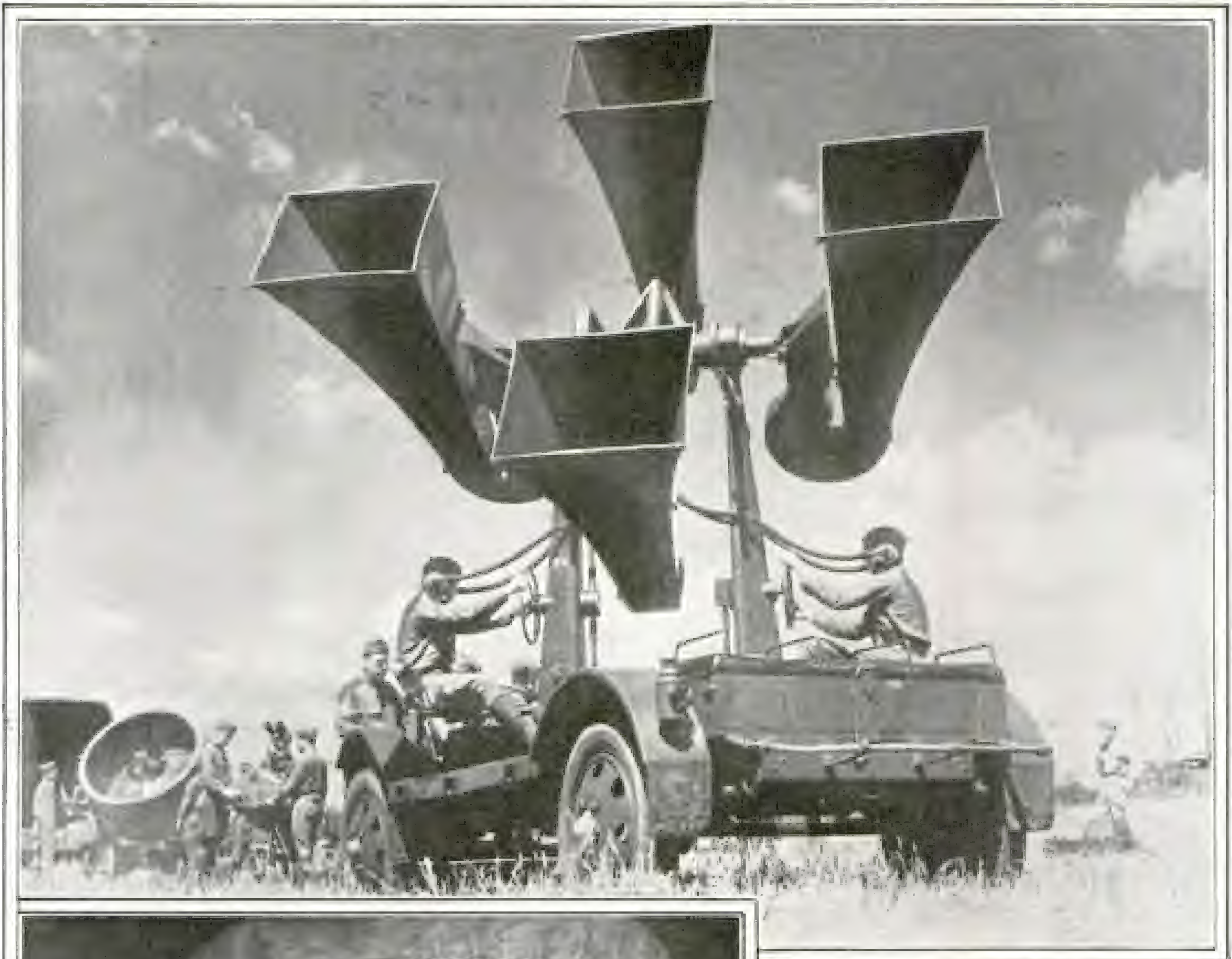
In practice, the number of communication "channels" is limited. One might think there are enough different wave lengths between ten meters and 30,000 to accommodate all the armies, navies, and air forces of both belligerents. Unfortunately, there must be a generous separation between different wave lengths if they are not to overlap each other and cause interference. Also, the long wave lengths require bulky antenna systems for the transmitters, which would not be sufficiently mobile to be suitable in warfare. The result is that where a large number of communication channels must be provided, crowding is un-

avoidable. This crowding brings into existence an entirely new form of warfare.

Nothing is more helpful to an army than to break down an enemy's communications. Then his coordination automatically breaks down, far-flung units become separated, team play ceases, supplies fail and cooperation ends. Chaos and defeat follow. This may be brought about by "jamming," or sending out a hodgepodge of powerful waves on all frequencies. If every wave length were involved, and if plenty of power were used, every receiving set would be smothered. Signals could not be read, and confusion and delay would ensue.

Whether the leading nations have devised jamming and anti-jamming apparatus is unknown. Obviously any such





*Top, U. S. army's huge "ears," sound locators tuned to pick up noise of "enemy" aircraft or motor equipment. At night, the detectors are synchronized with powerful searchlights which reveal the source of the sound. Bottom, mobile command position in truck during mimic war between opposing forces of U. S. army*

opments not generally known at this time.

Whatever would avert jamming one's own communications would also enable the other side to protect their communications. An inkling of these means would be all that is necessary for the secret to be worked out successfully. Before war actually breaks out it is extremely difficult for one nation to keep new developments in war equipment from other nations. Military attaches at the various legations, and secret intelligence operators manage to get hold of nearly every new thing. After war breaks out, however, it is different.

preparations would be kept secret. But it will be difficult to jam an enemy's radio communications without jamming one's own; to avoid jamming one's own calls for some entirely new inventions and devel-

Another new form of warfare in the ether probably will be the use of secret radio by spies. In the world war ultra-short wave radio was not available. Spies were

(Continued to page 150A)



# Ten-Car "Zephyrs" in Thousand-Mile Race



*The original "Zephyr" that started streamline styles for the Burlington railroad is a baby by contrast with its big brothers, the ten-car "Denver Zephyrs" drawn by twin Diesel power cars, soon to start a nightly 1,000-mile race between Denver and Chicago*



Ten-car twin streamline trains, "big brothers" of the Zephyr twins already speeding daily on three other middle western routes of the Burlington railroad, will start a nightly race against time next summer over the plains between Denver and Chicago. Dual Diesel-electric power units will streak over the 1,039 miles on a sixteen-hour schedule, hauling stainless steel cars accommodating 200 passengers and luggage. Included in the equipment are four sleepers, two coaches, diner, club and observation cars. These "Denver Zephyrs" will better present schedules by about ten hours, averaging around sixty-five miles an hour on the long overnight run. With several stops to make en route, the trains must cruise at ninety miles an hour. The Burlington's first "Zephyr" operates daily between Lincoln, Omaha and Kansas City; the original "twins" make daily round trips between Chicago and St. Paul-Minneapolis, and the "Mark Twain" serves Mississippi river communities between St. Louis and Burlington, Ia. The right of way along the Republican river valley in Nebraska was re-engineered last year, removing the last obstacle to sustained high speeds over the Chicago-Denver line.

## Pipes Seven Feet Deep Located by Magnetic Detector

Deep laid pipes whose exact location has been forgotten for years can be charted with great accuracy by a magnetic detector recently developed by the General Electric company. In emergency searches it has located pipes laid for forty years, some of them seven feet deep and as much as 100 feet away from the supposed line. The detector is an extremely sensitive surveying compass with adjustable bar magnet to minimize effects of the earth's magnetic field. Attached and turning with the compass box are two radial fins acting as magnetic antennas, increasing the sensitivity. If the pipe is non-magnetic, electric current is established in it by wires to the nearest hydrants. By setting up the detector at one side of the pipe line, making proper adjustments and plotting a curve showing changes in current indication as the detector is moved across the pipe line,

ⓈGlass frying pans and other cooking utensils which can be exposed to the direct heat of the flame now are being produced.

*Corning Glass Works  
Corning, N.Y.*

*Schenectady  
N.Y.*



the pipe can be located directly below the peak of the curve. To determine exact depth of the pipe, the detector is moved to a point under a return wire from the pipe; the wire is then suspended over the detector at a height equaling the peak current indicated in the curve plotted during the search. The distance between wire and compass box then equals the depth of the pipe below the box.

## Midget Automobile Built of Junk Runs Cheaply

Constructed of junk parts, a miniature automobile built by a Californian without plans or blueprints will run five hours on one and one-half quarts of gasoline. It has four forward and one reverse gear and attains a speed of thirty-five miles per hour. Parts from two discarded washing machines and a twenty-year-old motorcycle, together with scrap materials gathered at junk yards, were used. Excepting a drill press and a hack saw, only ordinary tools were used by the designer. The car operates by belt drive. A "kick" starter under the hood starts the two-cycle engine.



This little car was built without plans. Note the attention to detail, even to miniature headlamps and bumpers

## Four-Mile-a-Minute Transport Plane Carries Ten Passengers



Twin-engine transport plane developed in Germany. It carries ten passengers and makes a speed of 250 miles per hour

Germany recently launched what that country claims is the fastest transport passenger plane ever built. The twin-engine "Heinkel" ship, carrying ten passengers and a crew of two, is said to be able to maintain a speed of 250 miles per hour.

## Burning Coal Mines to Get Gas Is Tested for Economy

In Siberia and north Caucasia, the Soviet Republic, coal mines are being burned underground for their gas content. Many years ago, this economical way of using coal deposits of the lower grades was suggested by Sir William Ramsay, British chemist, and the Russian engineers are making a practical test of the theory. Already, it has been found that labor spent on the coal gas is only one-tenth to one-sixth of that needed in mining the coal. Also, it is possible to obtain gas from very narrow sheets of buried coal. The process calls for an air shaft to supply oxygen and exhaust outlets for drawing out the gas.

C. L. Lancaster  
478 E 60th St. Long Beach  
Calif.

Science Service  
11/4/36



F36

# How TO WIN the



By **CHARLES F. KETTERING**

*Vice President in Charge of Research,  
General Motors Corporation*

(As told to John M. Bonbright)

WHEN I was at the age of these young Americans who compete in the annual All-American Soap Box Derby, boys were not given the opportunity to coast down a hill straight into a college course. I'm sorry, too—because I believe that the United States would be a better country today, if more of those who are now grown men had learned in their boyhood the things that the young boys of today are learning in their striving to build worthy soap box racers and to drive them to victory. I believe every Soap Box Derby entrant who carefully follows the rules, who designs and builds his own car, who studies how to get the best performance out of his car, and who conducts himself in every race in a sportsmanlike



Top, two young builders assembling a derby car. Bottom, some of the major awards in the All-American Soap Box Derby. Note framed certificate marked "First Prize" which entitles winner to four-year college scholarship



# SOAP BOX DERBY

*Derby technical committee checking up on dimensions of old No. 7, original soap box car, before formulating the rules for the 1936 races*



## Charles F. Kettering

Vice president and director of General Motors Corporation and general director of General Motors Research laboratories; born on an Ohio farm in 1876; educated in country district school, normal school and Ohio State University; entered business as telephone installation manager; development engineer and then director of inventions department, National Cash Register company. Organized, with associates, the Dayton Engineering Laboratories company to manufacture Kettering inventions, including automobile self-starter and lighting and ignition systems; commissioned by General Motors to set up and direct research work; since 1925, "Boss" Kettering has been in charge of large staff of scientific workers inventing and testing automotive and other devices for General Motors.

own initiative, inventiveness and ingenuity in designing and putting together a car of his own conception than to start off with a set of blueprints and specifications to be followed blindly.

My opinion is that the thing most essential to building a good Soap Box car is brains—and that includes ingenuity and resourcefulness and, especially, what is known as common sense.

Any boy can build a four-wheel coaster that can be steered—and that is all required of a Soap Box car, subject to rules regulating safety, size, and weight. But everything depends on the boy's original plan for the car, and on his careful workmanship.

If I had had the chance to compete in these races when I was a boy, I would have proceeded just as I have always done in carrying out other projects—in developing the self starter, for example. The first thing is to learn what a Soap Box car must be and what it must not be. That infor-

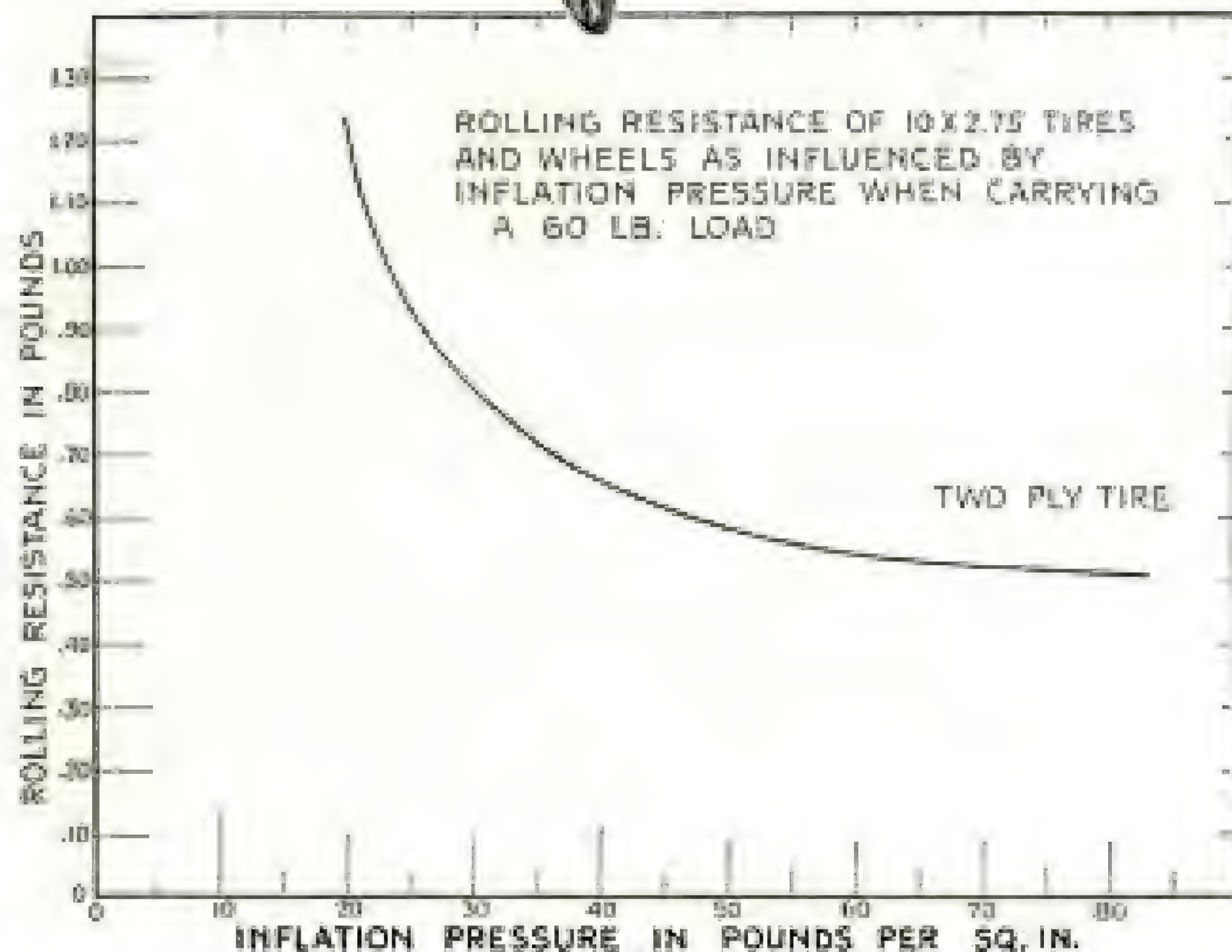
manner, is a better boy after the race—win or lose—and will grow to be a better citizen by applying the lessons of the contest to his everyday life.

I won't attempt to tell how to build a winning derby car because I believe it is of far greater benefit to a boy to use his





Illustrating different designs used by 1935 entrants. Bottom chart shows effect inflation pressure has on rolling resistance of small pneumatic tire under sixty-pound load, the tests being made by the B. F. Goodrich company



mation will be set forth in the 1936 rules. The next step is to consider advantages and disadvantages of different possible types of car—judged by cost, materials available, ease of construction, and performance. Rough sketches should be made and criticized and revised before any work is done. Consideration must be given the materials to be used. Will they make a strong chassis? Will they keep the car inside the weight limit?

Only when I had finally put a car together would my real work of trying to make it a winner actually commence. That's where the value of the proving ground comes in.

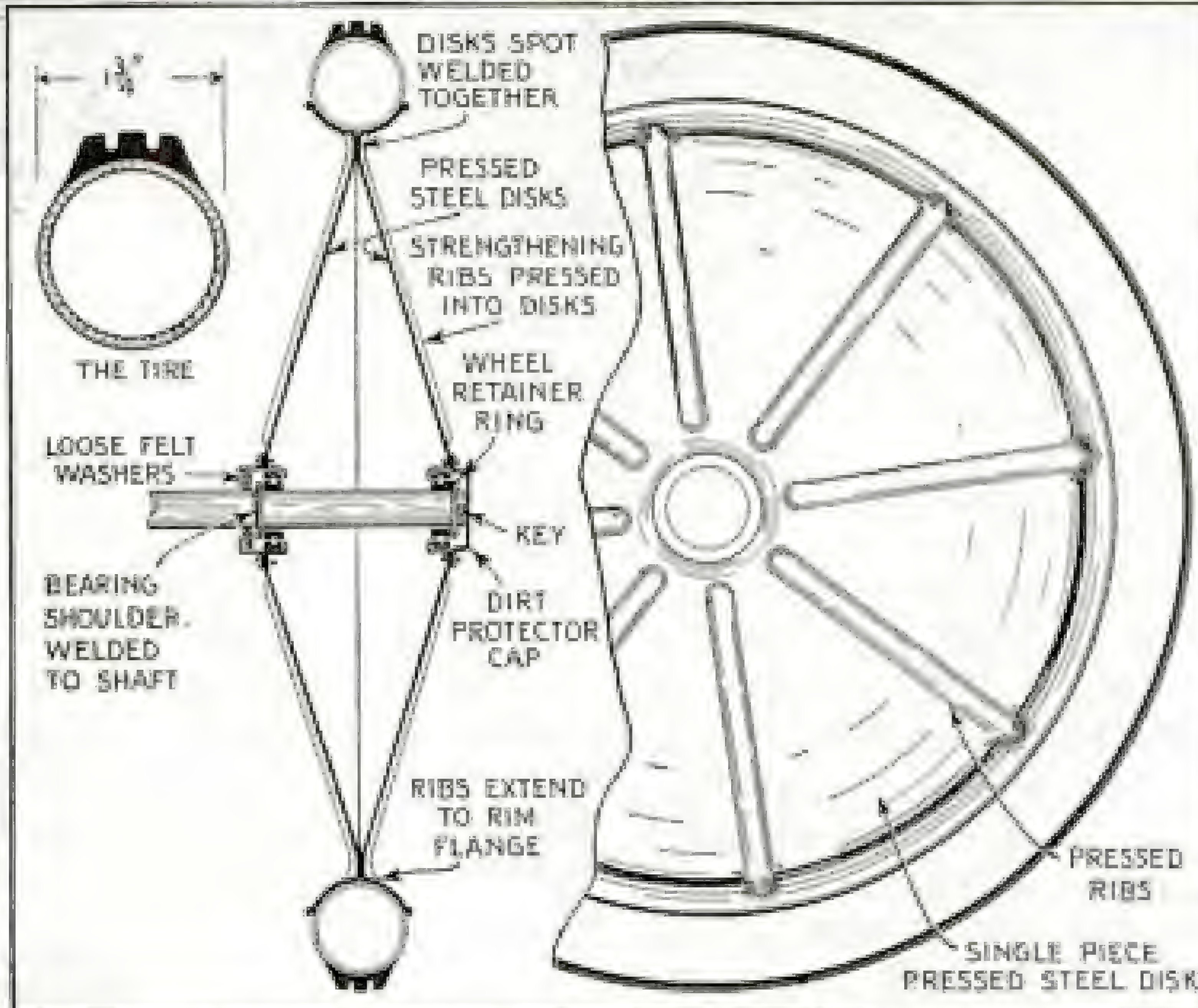
Suppose my car is designed with the simplest steering gear—a movable front axle, pivoted in the middle, with a wheel at each end. I know much depends on having both wheels alined to follow exactly parallel courses. I also know that on my first try I may not have succeeded in attaining the correct alinement. The wheels may toe out or toe in, imperceptibly, but enough to slow down the car. What do I do? First, I make a series of test runs on a grade, either timing myself or seeing how far the car will coast each time. Then I make the same tests over again—but first turn the front axle around. If the wheels toed out slightly before, now they toe in—and the car will run better because the road resistance will tend to offset the toe-in.





There probably is nothing I can suggest about building Soap Box cars that thousands of boys have not already realized for themselves. These contestants are smart! At the Akron finals last August, they were just as keen as the men you find in race crews at Indianapolis on Memorial Day. It was hot—very hot—that day, on the long brick-paved hill. As a set of four cars was waiting on the starting ramp, a small driver suddenly produced a can of talcum from his pocket, and liberally powdered the treads of his rubber tires. He had noted that the tar, squeezed up between the brick, and broiling hot, was soft and sticky. It would cling to his tires, and slow him down. But he knew the tar couldn't stick to his tires so long as they were covered with talcum.

You see, we engineers don't have to tell boys like these youngsters how to build soap box cars. Rather, I think it might be a good thing for automobile engineers to go to Akron next summer and, perhaps, pick up some pointers from the boys.



Sketch by courtesy the B. F. Goodrich Company

Top, crowd around 1935 winner, Maurice Bale, shown talking into microphone. Bottom, suggested construction of wheel and tire for the derby car

By PHILIP R. TARR

Physical Research Laboratory,  
The B. F. Goodrich Co.

The advantages of the ribbed racing tread such as was used on the winning car in the 1935 Soap Box Derby have been known for some time. For straightaway racing purposes this type of tread has the least rolling resistance of the many tread designs available. Under the conditions of

(Continued to page 120A)



From The Beehive. Jan 1936

544

POPULAR MECHANICS

# Air Lines to Girdle Globe

## on Seventeen-Day Schedule

Corp. & Hartford Conn



Black lines represent present air routes; heavy dotted lines are routes to be operated soon. Lighter dotted line marks Post-Gatty route

Seventeen days around the world by air lines on regular schedule! Only two gaps remain to be bridged before this dream becomes a reality. British, French and Dutch aviation companies soon will extend lines linking Bangkok, Siam, with Manila. Then, with the inauguration of regular air service across the Atlantic from New York to Europe probably by 1937, you can chart a 24,000-mile air voyage around the globe and reach home in seventeen days. Magellan's flagship, the "Trinidad," was first to circumnavigate the earth in 1522, taking 1,083 days to do it. Sir Francis Drake sailed around thirty-one days faster. Railroads and automobiles and airplanes slashed time and distance. In 1931 Wiley Post and Harold Gatty first flew around the top of the world in less than nine days. And while the "China Clipper" of Pan-American Airways was pioneering the new skyway from Alameda bay to Honolulu, Midway and Wake islands, Guam and Manila, repre-

sentatives of Pan-American and the British Imperial Airways were arranging joint transatlantic service to weld the last link. From New York you will fly by way of Montreal and Harbor Grace to Cobh and London, or via Bermuda, the Azores, Lisbon and Marseilles. From Europe you will board a plane for the Mediterranean, Baghdad, India and Siam. Air France extends to Saigon, soon will reach Manila; Dutch and British lines fly from Bangkok to Singapore and Java, and will extend to Manila, where, you will board a "Clipper" for San Francisco.

## F107 Polo-Golf Game Is Played in Back Yard

Combined features of polo and golf appear in a new back-yard game introduced recently in Miami, Fla. The game is played with a stick that resembles both the polo mallet and the golf driver. Putting the ball into the hole is the "goal," and it requires a sharp eye and good judgment of distance, just as in golf.



Odd sticks and ball used in game which combines features of polo and golf

Johnny Revolta  
Paul Canyon

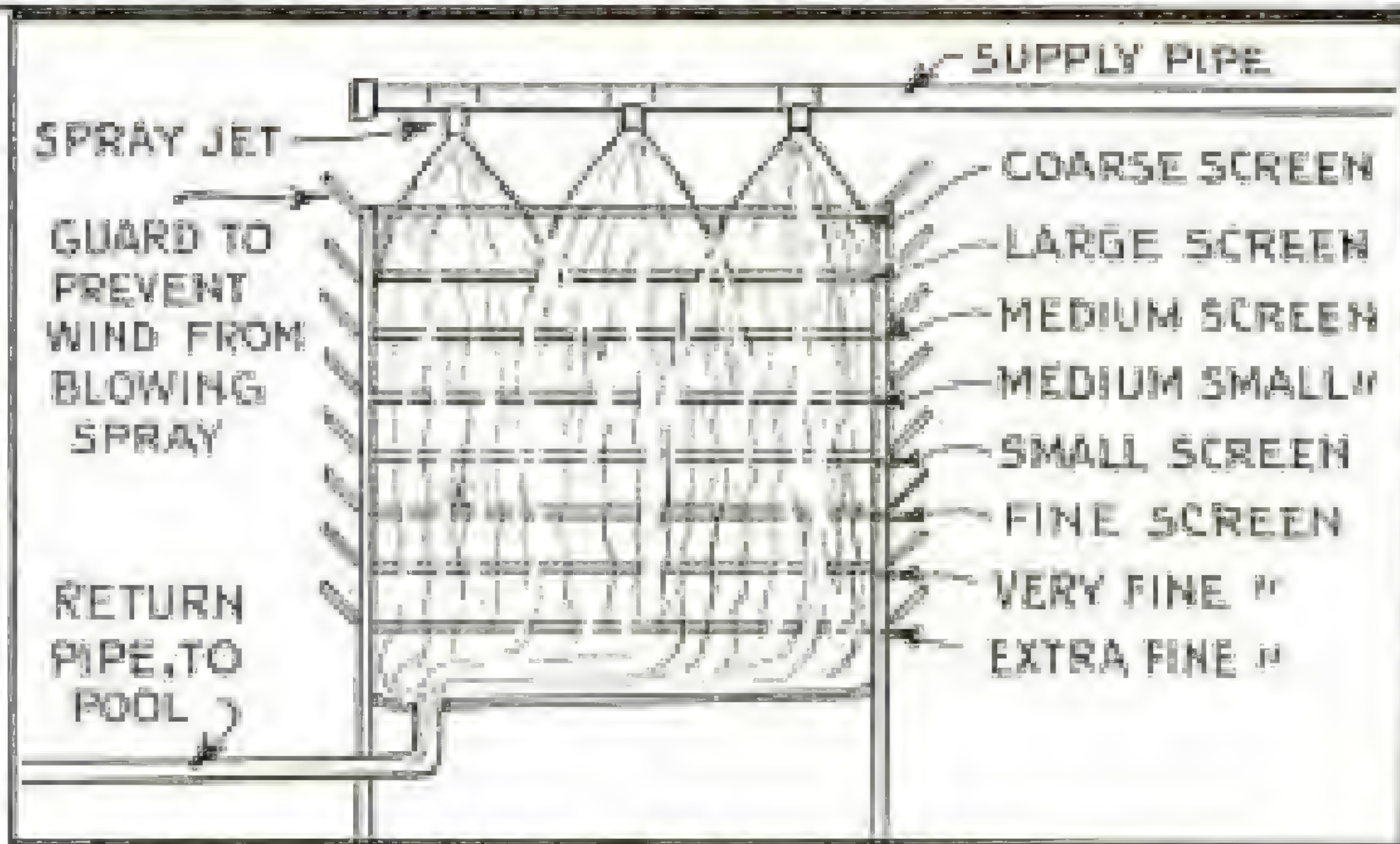


F 33 Cont Stanley H. Jess.

POPULAR MECHANICS

545

# Tower Keeps Water Cool for Swimming Pool

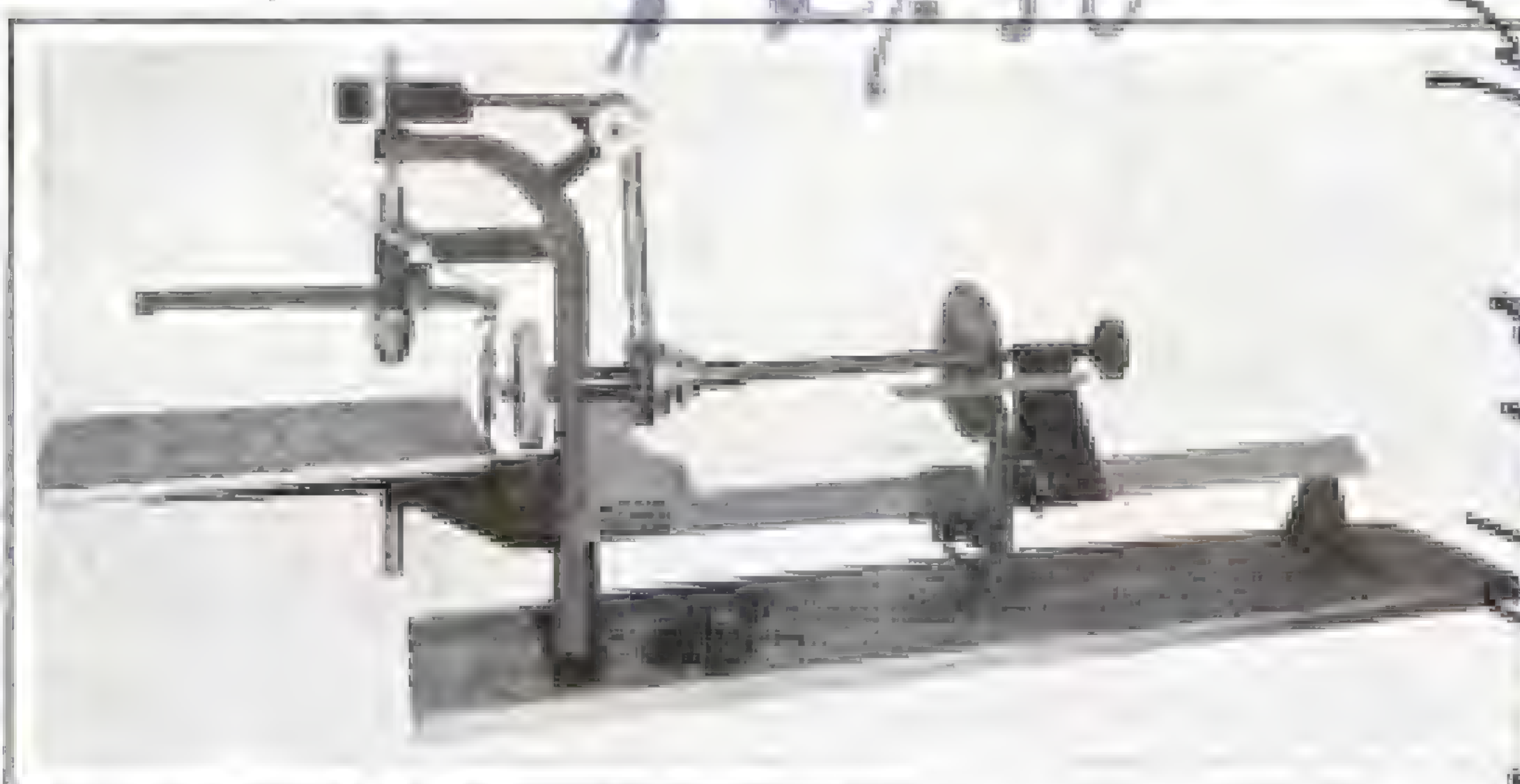


Left, cooling tower lowers water temperature for pool. Right, how it works

Passing water through the fine mesh screens which are a part of a "cooling tower" lowers the temperature several degrees and makes more comfortable a swimming pool near Phoenix, Ariz. The water is broken into progressively smaller droplets and evaporation produces a cooling effect. Operated in conjunction with a battery of filters, the tower helps to introduce oxygen into the water and increases the sanitary conditions. Samples taken from the pool by state health authorities were reported free from bacteria.

## Compact Woodworking Unit Has Tools for Many Jobs

Consisting of six tools in a combination machine, the latest aid to the woodworker is compact and inexpensive. It has a ten by thirty-six wood-turning lathe, a drill press that will carry up to one-half inch drill, an eight-inch disk sander, a twelve-inch jig saw, a five by three-fourths inch emery wheel and a mandrel to carry a six to eight-inch rip saw. It requires only a

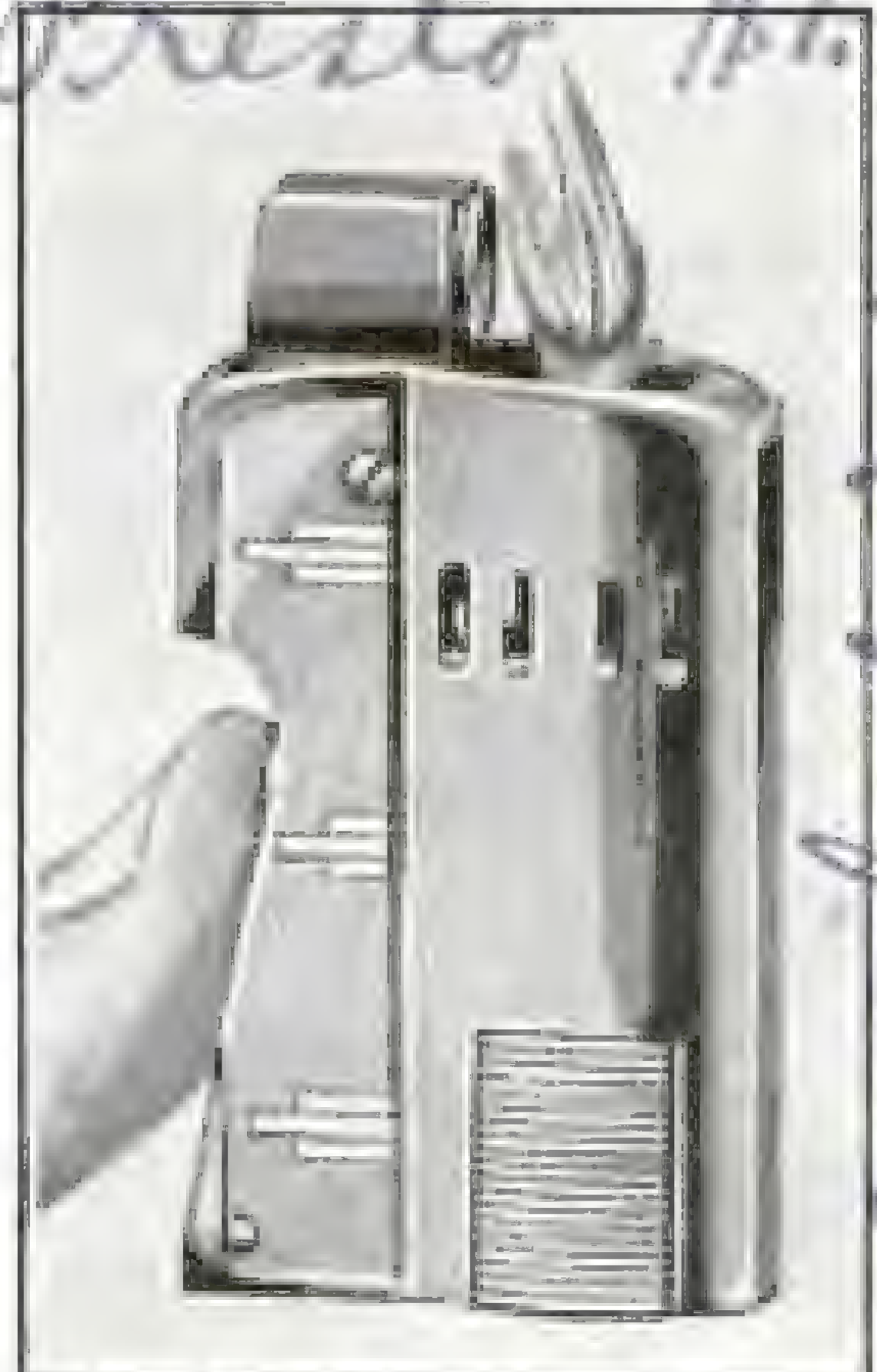


Simplified woodworking machine has a number of different tools for the craftsman

short time to adapt or remove any unit. Equipped with bronze and babbitt bearings, the machine is built rigidly to withstand hard usage over a long period. The table on the jig saw may be turned around for sanding and may serve as the turning rest for the rip saw.

## Windproof Cigarette Lighter Has Perforated "Chimney"

Equipped with a perforated "chimney," a windproof cigarette lighter ignites a shielded flame at the press of a thumb. It is adapted to outdoor sports, has automatic flint control, carries two weeks' fuel supply and has a removable tank which can be used as a torch. It will burn any of the common lighter fluids.



By atomic bombardment experiments, a new value for the atomic weight of hydrogen has been fixed at 1.0081 instead of 1.0078.

Science Review of Year  
1602 Fulford St. 1935  
Calam 200-1111



8 1485

# Re-Making the WORLD



Scene from Warner Brothers' "Captain Blood." The fight between two ships in this movie occurred on an indoor sound stage, the special effects department creating the scene

IT'S the boast of Hollywood that there is no spot on earth that the movies haven't reproduced to order, for one picture or another. They re-make the world—mountains, jungles, deserts, rivers, sunshine, moonbeams, fog, sandstorms, lightning, volcanoes, rain or snow—the special effects department will make any of them to order.

To the special effects crew, moving a naval battle, a snowstorm or Manhattan's skyline indoors is just a part of the day's work. And this moving of all outdoors onto a sound stage is not the result of "process shots," miniatures or trick photography. It is down-to-earth physical and mechanical accomplishment, on good concrete and steel foundations.

The shots are not obtained by photographing through painted glass, but by the sweat of thousands of carpenters, structural steel workers, electricians, mechanics and specialists of all kinds, and by the

brains and skill of artists, designers, engineers, chemists and special effects experts.

Warner Brothers has just completed a "crafts building," nearly all glass, that will be used to house specialists in resourcefulness and originality.

It is their job to find a way to do the impossible things that must be done when the movies re-make the world to order. From their desks, laboratories and experimental vaults go the plans that the workers in the foundry, the woodworking departments, the mills, the plaster and marble plant, the electrical department, the machine shops, the model works, the art gallery, the scenic and wardrobe departments must follow to accomplish the amazing results required.

Process shots are all right in their place, and miniature sets will pass for long shots or quick shots, but when a script calls for thirty husky pirates to swing, on rope's end, from one ship to the other, and drop,



61485

# for the MOVIES

cutlass in mouth, among the enemy, no model or miniature maker can do the job. It takes structural steel workers, carpenters and mechanics. So when it was decided that "Captain Blood" should be made on the home lot, in the studio's sound stages, instead of going on location, a big problem was passed on to Warners' miracle worker, Anton Grot. Carrying the title of art director, he is really the big brother of the man in overalls, and



*Studio officials looking over sketches of indoor sets prior to the making of "Captain Blood," and the fight between the two pirate ships which was staged indoors*



61485  
548  
Royal. c. 8-10-18



Two views of a sea-coast town built on a back lot in Hollywood for a recent production. The boats rest in real water which fills the concrete basin





*Water wheel constructed on indoor stage for one picture and a court scene built for another production*

upon his shoulders falls the job of solving any problem the production department happens to meet. And staging a sea battle between Captain Blood's pirate ship and the French man-of-war on a sound stage was a problem.

"Can you build two vessels that will let us use four hundred extras, and that will

photograph like ships at sea?" the studio executives asked Grot.

"We can build anything," was the reply.

"But they must be authentic reproductions," warned the executives, "true in detail as to boat construction, deck structures, carvings, riggings and gun mountings."

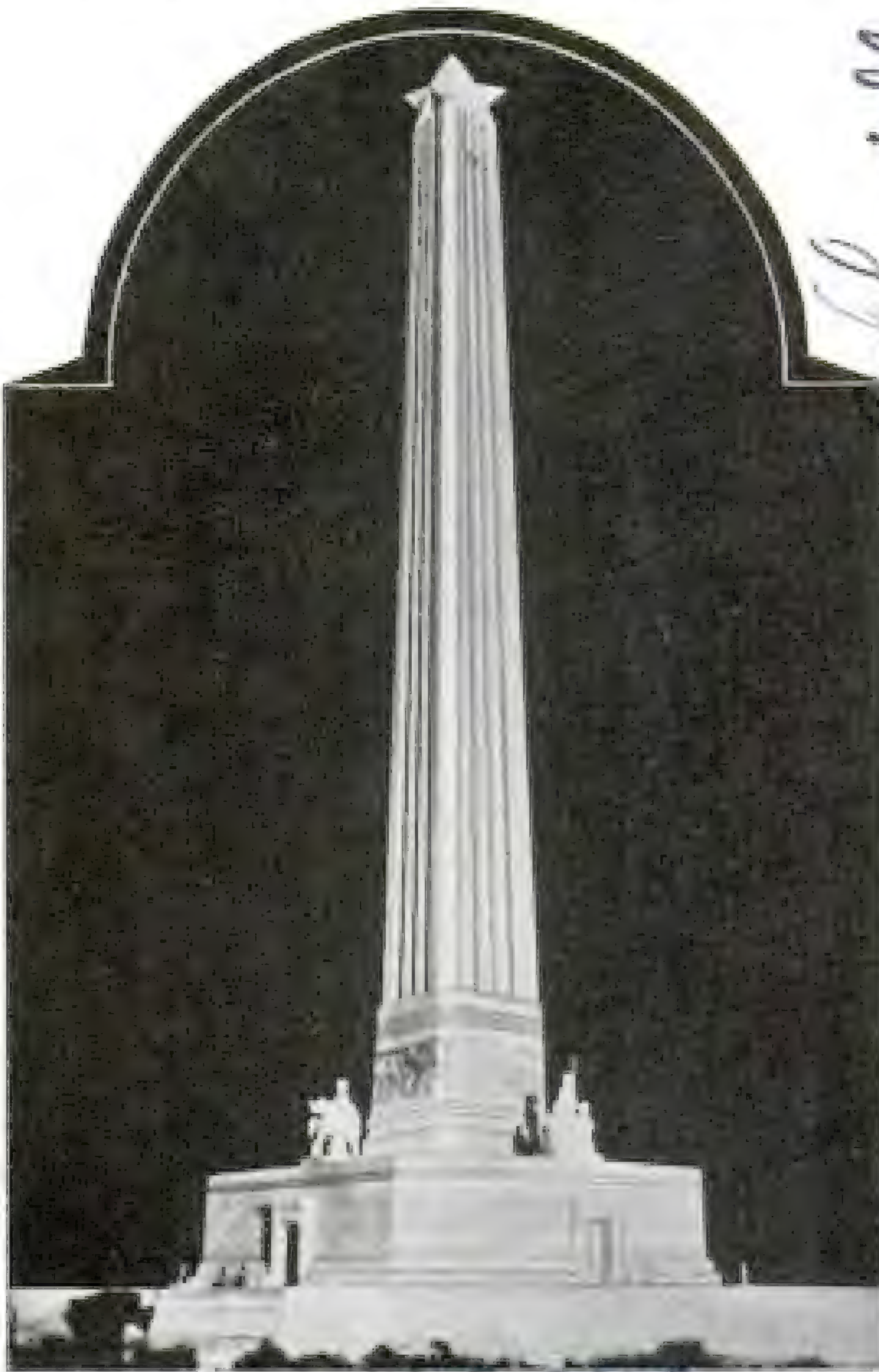
"They'll be authentic," was Grot's assurance. "We'll make your sea shots so natural you'll get seasick."

Grot burned midnight oil figuring a way to bring two battling ships under full sail across a billowing sea and ram them together to permit a bloody battle to be fought over their sides and in their rigging—and do it inside a sound stage. Grot works from pictures and gradually his

(Continued to page 144A)



## Lofty Texas Memorial Shaft to Have Fast Elevators



Elevators will take sightseers to the top of this shaft planned as Texas memorial

Towering 550 feet, the giant memorial shaft to be erected on the San Jacinto battlefield near Houston, Tex., will have fast elevators to carry sightseers to the observation level near the top. The base of the shaft will house relics of the battle in which the Texans under Gen. Sam Houston won their independence from Mexico. The memorial is a part of the plans drawn for the celebration of the Texas centennial.

## Radio Announces Street Name in Trolley, Bus and Auto

Controlled radio is used in a system for announcing street names and historical information in street cars, busses and autos passing near by. Two types of transmitters have been developed, one announcing from film and the other from a phonograph record. The transmitters are

placed upon poles and operated on power regulated to cover a radius of only one-half a city block. Directional antennas on the vehicles are set to pick up the weak stations as they approach them, and the street cars have receivers tuned to pick up only these stations. As the vehicle approaches the corner, the receiver picks up the signal and from a loud-speaker announces the street. These weak stations also are suggested as a means of fog warning. Operators of a ship or plane hearing one of the limited power stations would realize that the craft was too close to shore or ground.

## F69 Man-Made Wind Saves Fruit from Damage by Frost

Standing guard like a sentinel over a vast citrus fruit orchard in Whittier, Calif., is a wind-maker with a sixteen-foot propeller ready to thrust back any invasion of frost. In freezing weather it has actually prevented damage to trees. The



When frost threatens his oranges, this orchardist turns on his fan and blows the freezing air away

Ivan Ernieff, Jr.  
H.A. Bartholomay & Sons  
Engineers

Owned by J. E.  
Bowersmith



blades, whirling at 950 revolutions per minute, draw down warm air and keep it circulating in the grove, for frost does not form if the air is kept in motion. The propeller and its motor are mounted on a rotating base atop a forty-six foot steel tower. It guards a forty-acre citrus grove. A special study of its effectiveness is being made with instruments installed at four stations in the orchard by the U. S. weather bureau.

### Whale's Big Molars Replaced in Jaw for Exhibit

When a cameraman visited the grounds of the California Pacific International exposition at San Diego shortly before its reopening, he found one man replacing the molars in the jaw of a sperm whale. The whale is one of the wonders in the Palace of Natural History. Thirty-six giant teeth were set in the whale's jaw, just as they were when the big mammal was taken far at sea.



The photographer caught the "dentist" at work on huge teeth of whale in exposition building

## Fast Express Train in Japan Hauled by Streamline Engine



Japan's most advanced streamline locomotive, built in government shops, hauling the speediest express train from Osaka to Nagoya

Japan is going in for streamline designing in its modern engines. Hauling the fast express train between Osaka and Nagoya is a steam locomotive streamlined to reduce air resistance. It was built in government railway shops recently.

### Pouring Spout for Metal Can Prevents Spilling

Liquids can be poured from tin-can containers without spilling by using a spout attachment shaped like a U-pipe with sharp ends. The ends cut through the top of the container and the contents of the can pass through a



spout when the can is tilted. The spout is hinged so it can be folded against the U-tube when not in use, thus sealing the contents if all the liquid is not emptied at once.

Furnishes 158 Washington St.  
 Peckham, N.Y.

How and make



1/1/36

## Race Horses Require Shoes of Special Design and Weight



Dr. Hutslar with a collection of horseshoes he has designed for racing, saddle and harness horses

Shoes must be "tailored to measure" for race horses, and it takes considerable skill to shape up shoes of the exact weight and design for the fast-stepping horses of the turf. Dr. Charles F. Hutslar, a clergyman of Pomona, Calif., made a specialty of shoeing race horses, and has collected examples of the many types of shoes worn on the track. They must correct any weakness of the horse's leg or foot and must meet weight requirements within a fraction of an ounce.

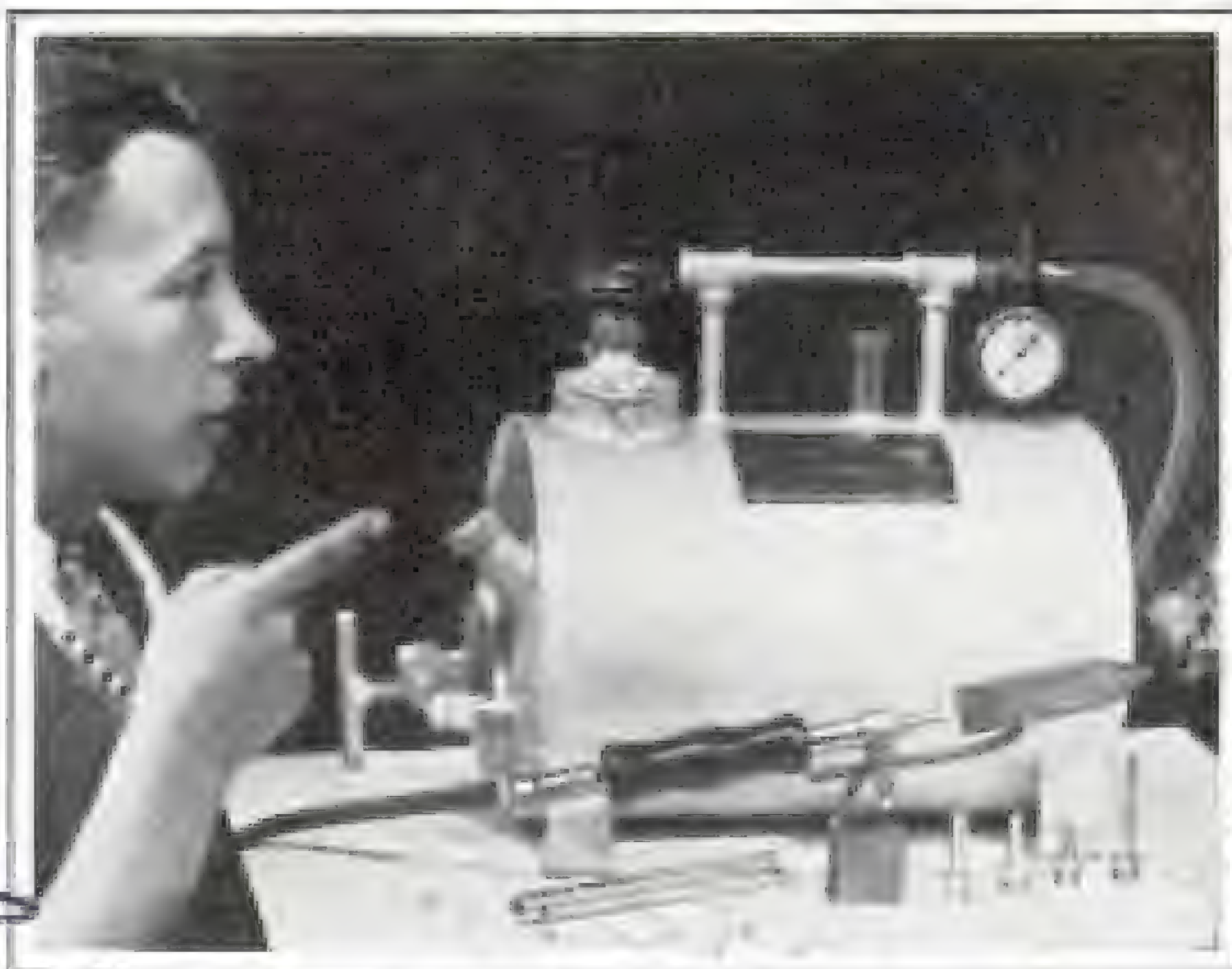
## Tiny Fire Bomb, Not Gas, Held Real Peril in Next War

That the two-pound incendiary bomb of thermite will be the real peril in the next war is the opinion of Prof. J. Enrique Zanetti of Columbia University's chemistry department. In discussing what might

happen to a large city in an air attack, Prof. Zanetti says: "The small size of these bombs may appear almost ridiculous, particularly after considering the tons of gas required to produce lethal concentrations. The small incendiary bomb is particularly fitted to airplane raiding. It does not have to be aimed and a single two-ton bomber could carry nearly 2,000 of them. Granting that only one in 100 makes a hit, that single bomber will start twenty fires within a few minutes of each other. What simultaneous fires would mean in a city like New York may be understood by considering that the Cunard pier fire in 1932 summoned one-fifth the entire fire-fighting apparatus in the city." The thermite bomb is a mixture of iron oxide and powdered aluminum, or magnesium, which is stable if protected from moist air. But if heated to a high temperature at some point, it reacts violently.

## Soldering Unit Makes Its Own Gas Supply

Housed in one compact unit, an economical soldering outfit produces its own gas supply from carbide and water. One charge of carbide will do four hours of continuous work and it is claimed the cost of operation per day for ordinary soldering, light brazing or torch work is



Soldering outfit which generates its own gas supply from a charge of carbide and water

Chemistry Dept.

Reiner + Campbell  
Chm. 242  
New York

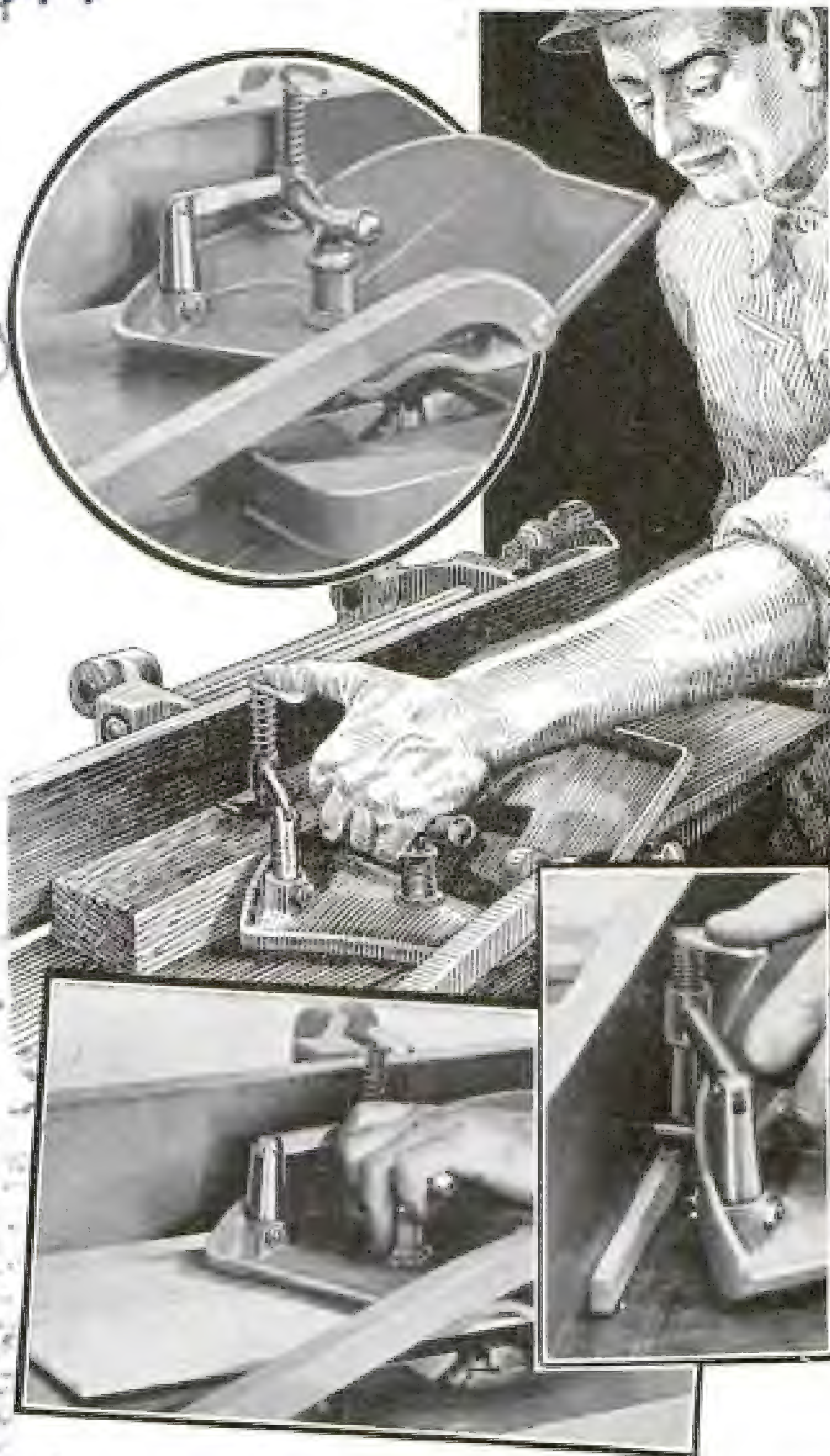


## Jointer with Improved Guard Makes Planing Safer

only ten or twelve cents. No pre-heating or pumping is necessary and the iron is hot after one or two minutes. The heat can be regulated for light or heavy work and the torch is equipped with a needle regulation and fresh-air feed device which is automatic in operation. The torch also can be used for melting or burning off solder or paint. The outfit is windproof and produces no dust, smoke or sparks.

### Airplanes Help Develop New Flower Varieties

Airplanes that chase summer back and forth between the hemispheres are stepping up the work of horticulturists in developing new flowers to double-quick time. Instead of the old, tedious process of waiting for spring to plant new seed varieties, the scientists send the seeds by plane as soon as they mature to some spot in the world where the season is right for the new crop. One plane acted as the "stork" for a giant nasturtium with sixty petals, first nasturtium to receive a patent in the United States. Three years ago a double yellow nasturtium was found in Mexico, with eight to ten petals instead of the usual five. David Burpee began in June, 1933, on his California farm to cross this Mexican nasturtium with various colors of the single variety. It required 50,000 pollinations by hand, the seeds being flown to Mr. Burpee's greenhouses near Philadelphia as fast as they developed. Second generation seeds were grown there, and in November were flown to Florida, Puerto Rico and Buenos Aires, planted, and the next generation of seeds flown back to Philadelphia and California, chasing spring. One seed finally developed into the super-double nasturtium with sixty petals, which is sterile but can be grown from seeds by using the proper treatment.



Several views of jointer in use. Note guard which also is used to apply pressure for planing properly

Equipped with a new guard which permits ribbon-thin planing in complete safety, a power jointer for large or small industrial plants is on the market. The guard is so designed that work can be fed under it while the operator's left hand, resting on the guard, applies the necessary amount of pressure. This permits planing wood down to a ribbon. Also, thin, narrow strips may be planed to practically nothing by feeding the strip between the fence and the curved inner edge of the guard. The jointer enables the operator to produce very accurate work.

W.A. Burpee Co., 18th and Hunting Park Ave Philadelphia

44-28-95-6-45-00



8 13 92

Combs, Thomas & Stinson,  
10555 Holman Ave

Los Angeles  
Calif

# KING of the



Official signaling start of race and, left, measuring completed racing block

4 Thos King Beechey Calif

nings on cold, hard figuring. Luck has very little to do with it. Dangerous as their work appears, they take few unnecessary chances.

Among those who race for the purse instead of the roar of the crowd is Chet Gardner, known as "king of the money drivers" because of his consistent wins. In the last five years Gardner has grossed better than \$25,000. Gardner owns his own car and pulls it on a trailer behind his sedan from track to track. In the last four years he has competed in more than 500 races on sixty tracks and, except for a dozen times when he failed to finish, he has nearly always placed among the winners.

**T**HERE are hundreds of professional racing drivers but you can count on your fingers and toes the men who make money at the game. Yet driving with death at the radiator can be made a paying business.

Big time drivers like Kelly Petillo, Louie Meyer, and Wilbur Shaw base their win-

Rex Mays, the young Californian who led the last Indianapolis race until forced out with a broken spring shackle, has netted \$12,000 in less than three years and averages better than \$100 a week the year round. Since he doesn't own his car and drives merely for the driver's split, Mays earns his owner something like \$10,000 a

225 E. Fairfield  
Glendale, Calif



E1392

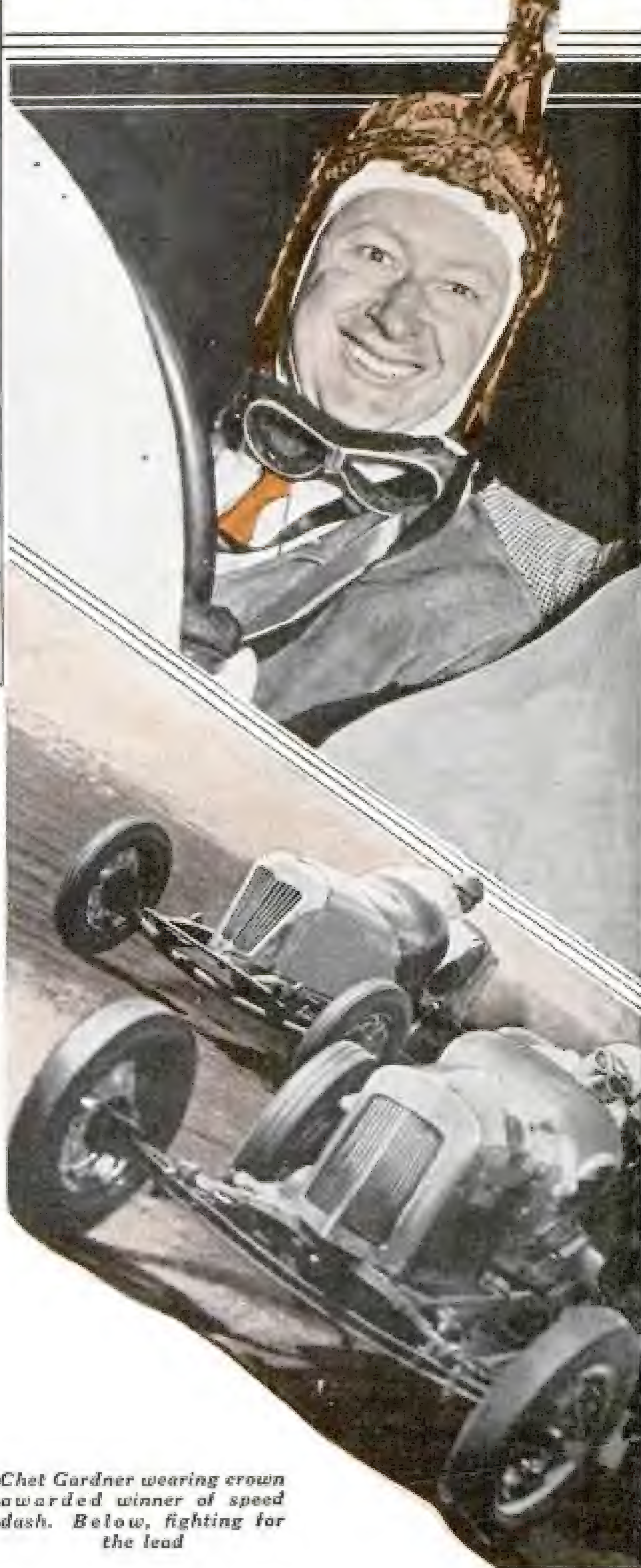
# MONEY Drivers



year. What are the secrets for earning a living on the track? First, says Gardner, is strong, sturdy equipment. "If you can't finish a race there's no need to lead it," is his motto.

The terrific hammering on dirt tracks has shaken apart many a prospective winner and in nearly every race three or four cars develop mechanical trouble and fail to finish. A part that costs only a few cents is more important than the engine if it breaks down under the strain.

But often a car finishes race after race without trouble, then everything seems to go wrong at once. In one 200-mile race the favorite had gone only a few laps when a new tire blew out. After a pit stop he started out again. Then the steering gear froze. That took ten precious minutes to fix. Next the cap vibrated away from the cowl oil tank and the driver was sprayed with oil. Finally, coming out of the last turn, his clutch broke. The man behind



*Chet Gardner wearing crown awarded winner of speed dash. Below, fighting for the lead*





*Measuring the top of a machined piston, and pit crew at work on a racer during a stop when every second counts*

him took seventh place and \$750 in prize money.

Gardner figures he "lost" a \$900 purse because he trusted his axles too long. He had installed new heavy axles early in the season and failed to inspect them periodically. Then one of them snapped in the middle of a race. The best way to hunt for trouble is to wash the parts in gasoline and tap them with a hammer. If a crack has started, oil is forced out of it and the weak spot can be seen.

"The best position in a race is usually the lead," Gardner says. "If the car and driver are good enough it's best to take the lead on the first turn before the field is at top speed. If that fails, wait for the

cars to string out, then pass them one by one. Fighting for the lead in the middle of traffic is always dangerous. If the leader should spin, every car behind would crash into him. And there's no way of telling what a blowout will do. I've had a front tire go flat and hardly hurt the steering qualities at all. Other times a blowout turns a car over. A driver should never push his car past the point where he has good control, just as with highway driving.

"Sometimes an experienced driver will hang back on purpose. Near the end of a race the leader may blow a tire or make a pit stop to change a wheel. Then a smart driver who has been slowing down on the turns to save his rubber can work his way to the front and hold it. Wrecks are always expensive and careful drivers usually think it wisest to take third or fourth place money at a safe speed than chance a wreck."

Gardner has never been in a serious wreck and in only one in which another car was involved. His worst injury was a broken collar bone received at the beginning of a 200-mile race. Loaded down with gasoline, his car spun on the first turn in front of a field of thirteen cars. All missed him and he hit the fence. He barely escaped a part in a spectacular crash when he made a pit stop at Altoona in 1929. A few seconds after Gardner stopped, a car went into a spin on a steeply banked turn. Ray Keech swerved out of the way of the spinning car and struck the outside iron railing, backed with heavy timbers, which bounced Keech's car back on the course. Along came another car that rammed

(Continued to page 128A)



ent Eckhardt

*Sound waves from violin appear on oscillograph at left. From these, patterns are made for the musician to follow in practice*

pende not upon the human ear, which varies in every individual, but upon science. There are many sounds that the human ear cannot hear. Leopold Stokowski, orchestra leader, is devoting much time to research in an attempt to bring to the ear of all the hidden "overtone." Ivan Eremeeff, research engineer, has been working with Mr. Stokowski in an effort to solve the problem.

## F75

ship is achieved by attaching a  
Indianapolis club



Enclosure is shown in place around cockpit, making this plane an all-weather craft. Vision is not obstructed

cockpit cover. One flyer constructed and equipped his plane with an enclosure which cost slightly more than \$10.00. The conversion was made without changing the primary structure of the ship. There are no welded joints and the increase in weight is less than eight pounds. Doors of the enclosure are hinged at the top to facilitate emergency parachute jumps. Flying characteristics of the plane are unchanged, save for a slight increase in top speed. Installation of the cover is simple. Occupants of the cabin may converse freely without annoyance from the roar of the engine.

**Powdered Jolly Aircraft**

an all-weather craft. Vision is not obstructed the engine.

Capt. Fred Goetz, 4457th  
(also builder) Albatross, 1st Squadron



*Capt. E. W. Percival*  
 POPULAR MECHANICS  
*England.*

*Harry Vinick*  
 1228 Harrison  
 Beaumont, Tex

## Plane Fits into Garage

### I 51 When Wings Are Folded



*Demonstrating how hinged wings can be folded to permit housing the plane in ordinary garage. The ship cruises at 150 miles per hour*

Rated at a top speed of 170 miles per hour, a new four-seater monoplane manufactured in England is housed in a small garage when its wings are folded. The craft cruises at 150 miles per hour while fully loaded. Its flying range is 630 miles. The plane is another product of the movement to popularize flying for the family, which makes it necessary for the ship to be easy to fly, reasonably safe and small enough to be housed in a small space while not in use. A number of small, low-priced planes are being tested for the same purpose in the United States.

## Gasoline Made of Waste Gases Is Almost "Perfect"

Reversing the process of "cracking" to produce automobile fuel has resulted in production of gasoline which is rated at ninety to 100 octane, or almost "perfect" in antiknock value. This new process, called polymerization, consists of building up light gases and liquids which gasify easily at ordinary temperatures by the application of high pressure and heat. This means that refinery waste gases, which are a by-product of the cracking of heavy oils to make gasoline, can be converted into high-

tion from cracking operations is about 300 million cubic feet annually from which might be produced one billion gallons of gasoline by polymerization. This would be about five per cent of the total motor fuel output for the United States for one year.

### I 48 Wheelbarrow Adapted to Snow by Attaching Runner



*Fastening runner rigidly to the wheel converts wheelbarrow for year-round use*

With a single runner attached to its wheel to facilitate operation on the snow,

*Write Harry Vinick*

*1228 Harrison*

*Beaumont, Tex*

*1228 Harrison*



Ed Doughty,  
Asford Maine

F 42

a wheelbarrow is used the year round by a resident of Maine. From early fall to late spring, a period in which Maine is subject to considerable snowfall, the wheelbarrow is used as a sort of sleigh or sled. It slides easily over the snow on its runner, making it possible to carry large loads.

# Ship Beached in Dense Fog Stands Like Balanced Rock



High and dry on an English beach, erect as though propped in a dry dock, stands the steamer "Michalis Poutous" where she grounded in fog.

## Inner Tube Boat Rides the Waves at the Beach

Riding the ocean waves is an exciting water sport which is made even more thrilling by using a "boat" without a bottom or sides. The craft is made of inflated inner tubes attached to a cypress framework with canvas strips. The forward section of the boat also is of canvas and the craft stays afloat even when encountering big waves.



Wave-riding boat made of inner tubes attached to cypress framework with canvas strips

Run aground at Lilstock, in the Bristol channel during a soupy fog, the Greek steamer "Michalis Poutous" stands high and dry on the beach like a balanced rock. Her crew of twenty-nine was rescued by lifeboats from neighboring English ports.

## Tape Kills Moths in Clothing by Emitting Vapor

Moths can be destroyed in clothing by using a new gas tape which emits an insecticide-vapor. The tape comes in clean, non-adhesive rolls which can be cut into convenient pieces to be inserted in sleeves, trouser legs and other parts of garments. Vapor given off by the tape does not stain or injure furs or clothing. No heating is required and there is no lingering odor. Applied in tape form, the active insecticide is spread out for rapid evaporation. Materials to be protected are wrapped tightly to prevent the gas from escaping before eggs and larvae have been destroyed.

End Barbara Des. The March, Route 1, Box 655,

Edelmann Co. 6249 St. Lawrence  
Chlorine

Made by Mr. O.A.  
Tatnell, Kalamazoo  
Mich.



## Jonahs' in Jaws of Whale Prove It's a Real Man-Eater



Two Maori native "Jonahs" standing in the jaws of a whale. The natives use open boats to catch the huge mammals

Almost obsolete methods still are used with excellent results by Maori natives in catching whales. The Maoris hunt the huge mammals in open whaleboats when the creatures pass the coast in large numbers on their annual migration to and from the Antarctic. Just to prove that they really catch the big ones and that these whales deserve the title of man-eaters, two natives posed inside the jaws of one of the mammals. Standing inside the mouth, which looks like a big steam shovel, they had plenty of "head room."

### Lumber Is Made Fireproof

#### F27 by Salt Treatment

Wood that is "practically noncombustible and nonflammable," described in this manner by the laboratory of the National Board of Underwriters after tests, has been produced by Protexol Corporation. Walls and floors of lumber treated with incombustible salts have been found to act as fire-stops, preventing the passage of flame and confining the fire to its point of origin. The fireproofing properties last throughout the life of the wood. Workability of

the fireproofed lumber is said to be equal to that of untreated wood. Ability of the wood to take paint and varnish is unchanged and its weight is only slightly greater. Fireproofed floors subjected to the intense heat and flame of gas-fired furnaces came out blackened and charred on the exposed surface, but intact and otherwise sound after extensive tests.

### F14 Light on Stirrup of Police Horse Warns Drivers

As a warning to traffic, a new safety light for mounted policemen is attached to one stirrup. Developed in Amsterdam, the lamp is small enough to cause no inconvenience to horse or rider, yet it gives a bright red glow which warns motorists. Current for the lamp is supplied by a small battery.



Protection of mounted policeman from traffic is afforded by lamp shown on stirrup



## Crash Boats Aid Air Liners in Trouble at Sea

One task of Pan-American Airways in maintaining its transpacific route is to keep sufficient supplies of fuel, oil, water and food at the Midway, Wake and Guam island bases. Important links in this supply service are four tow boats or "crash boats." These are thirty-eight foot, twin-screw tugs which transport supplies from freighters anchored off shore and also go to the aid of an airliner at sea in case of trouble. These tugs resemble the old type double-end whaling boats. They are powered with

two gasoline motors of sixty horsepower each, have a speed of eleven miles an hour and a cruising radius of 1,100 miles. Living accommodations for four persons are provided below decks. Radio compasses like those aboard the air liners are part of



Crash boats which will go to aid of transpacific air liners in trouble at sea and will also serve as tow boats at island bases

the equipment, and the boats are so designed that they can pass under the wings of an air liner at sea to service or replace a disabled motor. The boats often make trips between supply ships and shore with barges carrying loads of sixteen tons.

## Photos Given Color Tones by Secret Chemical Process



Dr. Arthur Rodzinski examining photograph of Moroccan scene which he has printed in color tones by his own secret formula

Printing photographs in color tones is the latest accomplishment of Arthur Rodzinski, conductor of the Cleveland symphony orchestra and an enthusiastic amateur photographer. He has developed an original process for enhancing prints with color tones, and is keeping his chemical formula secret while continuing experiments to perfect the method. In the illustration Dr. Rodzinski is examining a Moroccan scene he photographed last year. The building is printed in a tan hue, and the columns are milky white.

☞Cacao or cocoa beans were the monetary unit of the Aztecs and Mayans of Central America at the time of the Spanish conquest and were also used as a beverage, but only the wealthy could afford to drink their "money."

Smithsonian  
Report. 61934  
p. 426



8/26/27

Cont. Walter E. Burling  
1032 Florida Ave

# SHOOTING

Warren, Ohio



phers and photography, and will sponsor candid-camera nights at local theaters.

The idea of admitting photographers to theaters and other places and letting them shoot to their heart's content is spreading, and it's great fun for the camera owner, for there is a fascination about stage photography difficult to find in other branches of the hobby.

The making of pictures in the theater, radio studio and wherever else there is fairly good artificial illumination is within the reach of amateur photographers, thanks largely to new high-speed films. Not many years ago a camera equipped with an f:4.5 lens—that is, one whose focus is 4.5 times as great as the maximum diameter of

**T**HE photographer who likes to snap pictures of stage shows and other difficult subjects has had a break. Not long ago the girls of Earl Carroll's "Sketch Book Revue" performed before a New York audience composed mostly of 400 amateur cameramen, and thereby inaugurated a new deal for people who make pictures for fun.

Little cameras, big cameras, cameras equipped with super-speed lenses, and others with ordinary lenses snapped in the orchestra and from the boxes. Other theaters have taken up the idea, and have announced special performances or morning rehearsals for photographers. Radio station WHN of New York City has started a series of broadcasts featuring photogra-



Interesting bits of action on the stage and before the microphone caught by the candid camera. Some theaters give special performances for photographers



# Cameras Super I format Centar. in the DARK

E 1267  
Carl Zeiss Co  
485-5th  
An. New York

the lens opening—represented the ultimate in speed equipment, and was correspondingly high-priced.

Today, a great many amateur cameras having f:4.5 lenses are in use. Their cost is not great and with such a lens it is possible to obtain very good pictures of stage action. Of course, there is a limit to what can be done. Whereas, the miniature camera having an f:1.5 lens, which is nine times as fast as the 4.5, can shoot pictures of a dancer at one two-hundredth of a second, the f:4.5 lens owner would have to wait for less violent action,



Central Camera Co  
230 S. Wabash  
Chicago



Camera enthusiast preparing to make a shot of a radio broadcast, and soloist snapped by candid cameraman

which he could snap at one-twentieth of a second.

For theater and similar photography under artificial light conditions, fast panchromatic film, sensitive to all colors, is used almost without exception. During the past few years the speed of film has

been increasing gradually, so a given camera lens today is, in effect, several times as fast as the same lens a few years ago. High-speed panchromatic film is available today for roll-film and film-pack cameras and those using thirty-five millimeter motion-picture film can be loaded with a new material whose speed is considerably greater than that of any other film. Rumors have it that even higher speeds are in the offing.

So, as far as film materials go, the amateur photographer, regardless of the camera, can get printable results from the average stage show. It is entirely possible for a skillful photographer to obtain a successful picture with an ordinary box camera. He would, of course, have to wait

until action is temporarily suspended. This waiting for the psychological moment is one of the tricks the theater photographer must learn. Almost any action has moments when the performers are relatively at a standstill. By learning to anticipate such moments, shots can be made at rela-





*Photographers "shooting" a radio broadcast. Below, waiting for the psychological moment*

tively slow shutter speeds. Another trick is to snap the shutter as the performer moves toward or away from the camera.

The front row of the orchestra usually is a good location for the photographer. So are boxes near the stage, and front balcony seats. Better see the show once before attempting to make pictures and pick the best location for photographing. If the camera shutter is noisy, wait until the orchestra is doing its best, or build a sound-proof case for the camera, leaving only the

lens, shutter and film controls projecting through. Stout cloth padded with a layer of cotton or other sound-absorbing material can be used.

Many failures in theater photography result from camera movement. Often the shutter speed, because of light conditions, is not great enough to overcome muscle quiver and other body movement. If possible, rest the camera against some solid object such as a balcony railing; or use a tripod. Or hold your breath and try to keep from quivering when you snap the shutter. Experienced photographers can hold miniature cameras steady while making one-half-second exposures, but it is safer to support the camera against something solid.

The average theater stage is well enough lighted to permit pictures to be made with available films and camera equipment, without resorting to various tricks that boost the film speed. However, the rabid photographer cannot resist prefogging film, bathing it in ammonia, or otherwise trying to make it faster.

Prefogging is making a preliminary exposure in a way that will fog the film slightly. This can be done by letting a very weak light fall on it before it is loaded.

(Continued to page 116A)



# Switch Controls Homemade Miniature City



Top, William Woodring at switches which control operation of miniature city designed and constructed by him in his Brooklyn home. Note the small electric train and tiny figures on midget farm beside the track. Trains roll, bells jingle and chimes of the Wedding March issue from a little church when the current is applied by throwing a switch

Above, one part of the miniature city, showing the little railroad station, three sets of tracks and a passenger train and a freight rounding the curve at top of photo. Also shown are the church and several houses. Bottom, close-up of the residential section, showing the fine attention to detail in construction of the houses. Midget automobiles and tiny figures on the sidewalk enhance the appearance of realism, so skillfully has the artist introduced the illusion of motion



1032 Leates Ave. Wey  
Brooklyn.

1032 Leates Ave. Wey  
Brooklyn.



## 738. Super-Liner Planned for Fast Ocean Service



*Artist's rendition of great liner to be constructed for Atlantic service. Note that decks are enclosed and that there are no portholes. The ship will be supplied with conditioned air by latest equipment*

One of the two government-built superliners planned for the north Atlantic service is depicted by the artist as a radical departure from accepted ship design. The entire liner will be sealed and air-conditioned, with no open decks and no port-

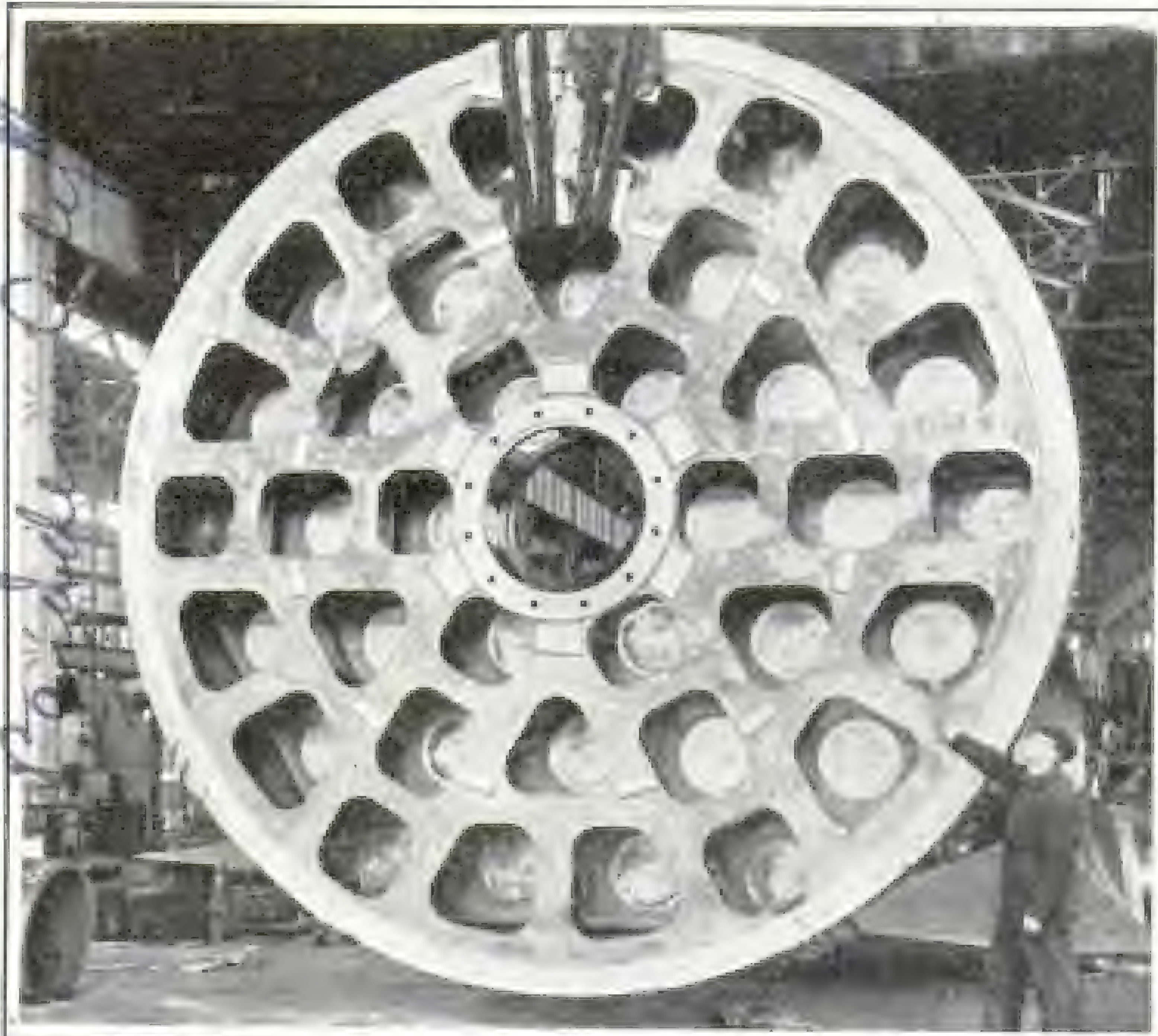
holes. Far different from anything afloat, it will have a speed of forty-two knots and a passenger capacity of 7,000. Advanced streamlining is a feature of the ship. One-way fares to Europe of \$60 are included in the plans for the new service.

## 739. Grinder with Human Touch to Polish Eye for Telescope

Operating with an almost human touch, a giant grinder will both grind and polish the 200-inch mirror for the world's largest

telescope now being erected in California. A 25,000-pound mirror cell and grinding table rests in the center of a thirty-foot

high structural framework which supports the mechanism. Made of steel plate with welded construction, this table is 208 inches in diameter, and when the pan for catching the abrasive material is bolted to the face, the over-all diameter exceeds 240 inches. The table is actuated by an electric motor with a worm gear drive. On the top and protected by a two-inch layer of sponge rubber will rest the mirror. The grinding of the mirror involves five distinct motions: first, a counter-clockwise rotation of the table; second, a counter-clockwise motion of the grinding tool, mounted on a carriage; third, a



*Mirror cell which will be used in grinding the "eye" for giant California telescope. Five motions give apparatus a "human touch"*

*Baldwin Southworth Corp.  
Edgystone, Pa.*

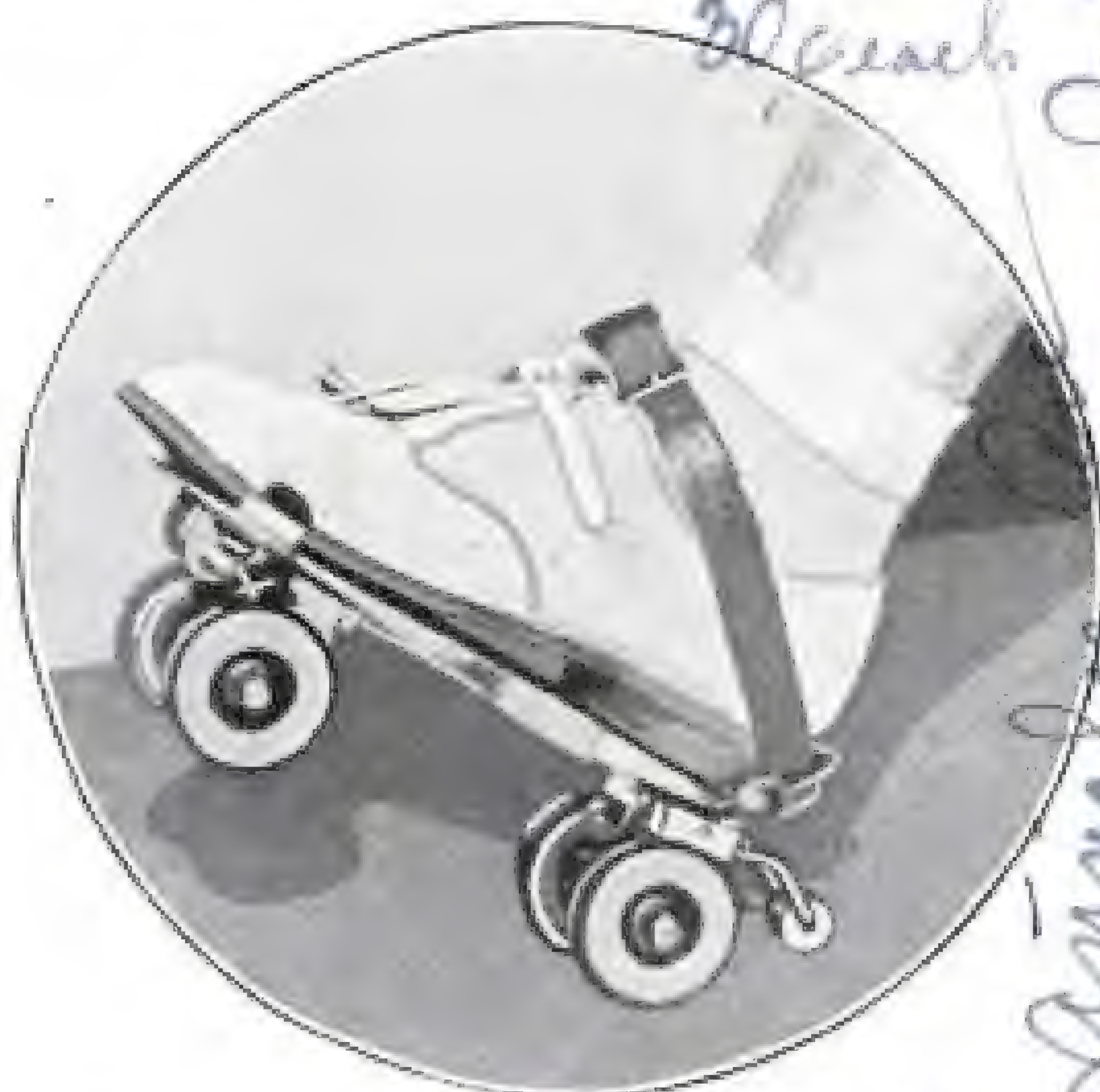
*Created by scientists of California  
Institute of Technology.*



bridge upon which the tool carriage is mounted travels back and forth; fourth, a motion of the carriage holding the grinding tool at right angles to the bridge, but guided by it, and, fifth, a quadrant rocks and tilts the table for purposes of test and inspection. These movements will give the mirror a concavity that will be smoothed and corrected to parabolic shape with a pitch-covered polishing tool and jeweler's rouge. The first grinding tool, a convex metal dish of the same diameter as the mirror, will be faced with glass blocks two inches square.

## Safety Brake Stops Roller Skates Instantly

Five-wheel roller skates are the latest innovation. The fifth wheel is a tiny aluminum roller at the back which applies brake-blocks to the rear wheels when the foot tilts backward. The brake prevents falls and gives skaters instant control in avoiding collisions.



Kick your heel back and the aluminum roller sets brakes on the rear wheels of your skate

## Model of Cape Cod Canal Aids Study of Channel



Large model of proposed Cape Cod canal. Note size of man at left center in comparison with the model, the length of which is 115 feet

Built on a scale of nine feet to the mile, a model of the Cape Cod canal is helping scientists study the effects that tidal currents will have when the waterway is enlarged to a width of 700 feet and a depth of forty feet. The model is 115 feet long, including its approaches. As constructed in Massachusetts Institute of Technology, the model presents Cape Cod bay as a rectangular body of water, with Buzzards bay and its many islands and indentations in the foreground. The channel of the old canal winds across the far side of the bay, while Hog Island channel leads out from the old channel and crosses the middle of the bay, marking the route of the deeper and wider channel under construction. Along the course of the canal proper are instruments for measuring and registering the rise and fall of the miniature tides.

¶ Ducks whose gizzards yielded gold nuggets gave prospectors the clue to pay-dirt deposits in the Ural mountains.

The Roller Skate  
 Price \$6.20  
 Acme Service  
 12/20/25

Mass.  
 Cambridge



# Ship Flies Five Miles a Minute Five Miles Up



Engineered for cruising in the sub-stratosphere—around the 26,000-foot level—this twin-motored monoplane is expected to set a five-mile-a-minute pace.

New York is scarcely twelve hours from Paris in such a speed plane as the "Cru-sader," designed by Thomas M. Shelton and exhibited recently at Miami, Fla. It was built to cruise at five miles a minute at an altitude of 26,000 feet. The ship is a low-wing cabin monoplane powered by twin engines, and with twin tail units that stretch far back of the tail wheel.

## Meter Tells Your Glove Size by Measuring Hand

Retail glove counters are being equipped with a "meter" which accurately measures your hand and shows on a dial what size glove you should wear. The hand is inserted through a metal strap on the instrument and the middle finger presses forward a movable button so far as stops between the fingers permit. The glove clerk then tightens an adjustment knob which fits the metal strap firmly around the hand. Thus both finger length and hand width are registered on the dial.



Meter that registers glove size on dial

## Two-Pound Piston and Rod Unit Develops More Power

Made of lightweight aluminum alloy, a new piston and connecting rod is available for high-compression Diesel and racing engines. The unit produces more revolutions per minute, due to the short length of the rod, and compression can be carried as high as twenty to one, according to the makers. An air gap gives the proper degree of cooling to cylinder walls. The assembly operates with a two-point bearing on the cylinder wall. No ledges are formed and the edges do not wear off the rings. Connecting rods can be removed from the engine without taking off the cylinder head. The complete unit for a Chevrolet motor weighs only two pounds. Use of babbitt for bearings is omitted, since tests show the alloy develops a smooth glaze and stands up as well.



Popular Mechanics Magazine does not publish the name of the maker of, or dealer in, any device described in its pages, but this information will be furnished by our Bureau of Information upon request, accompanied by stamped envelope.

by Prof. A. C. Davis  
Cornell Univ. - Ithaca, N.Y.

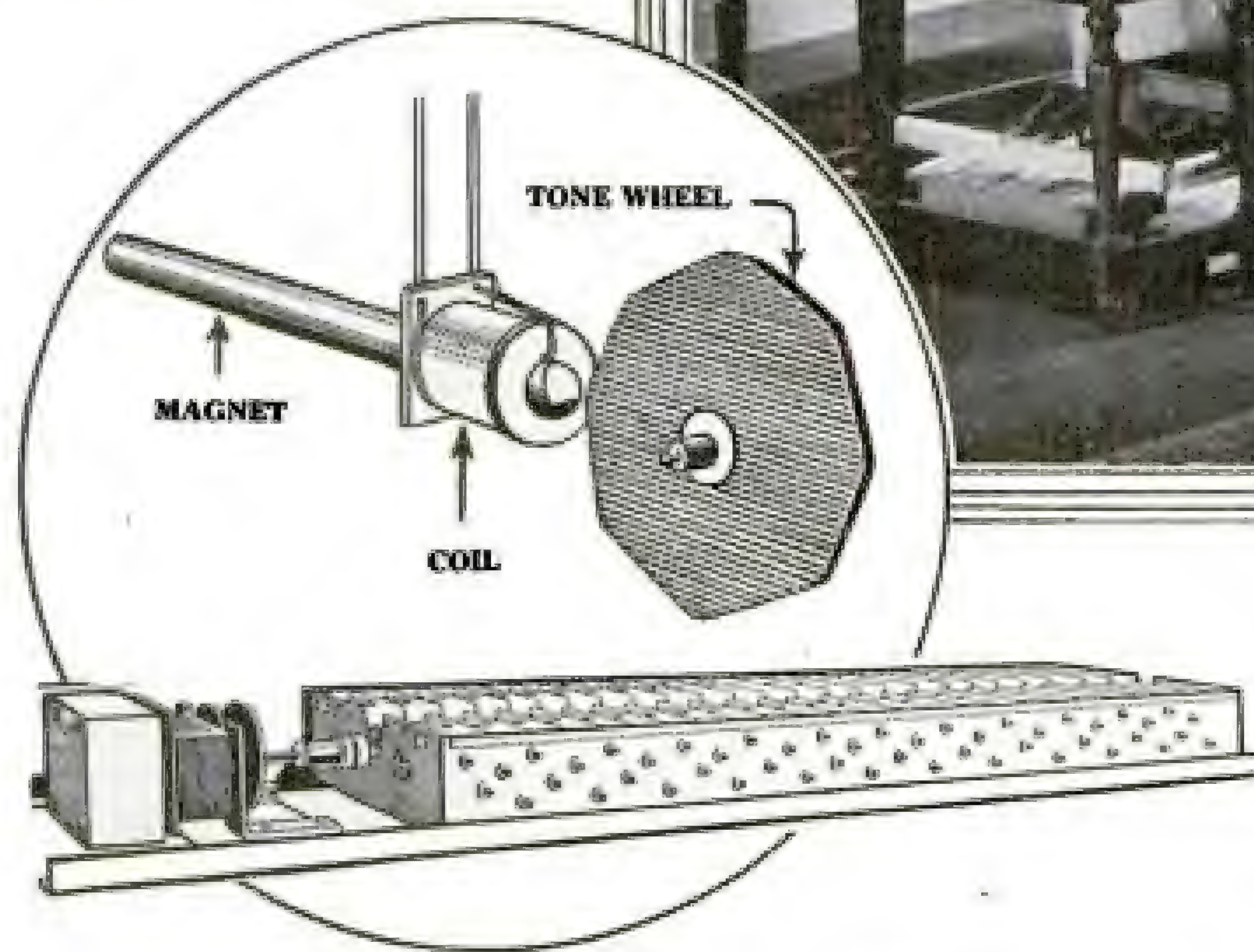
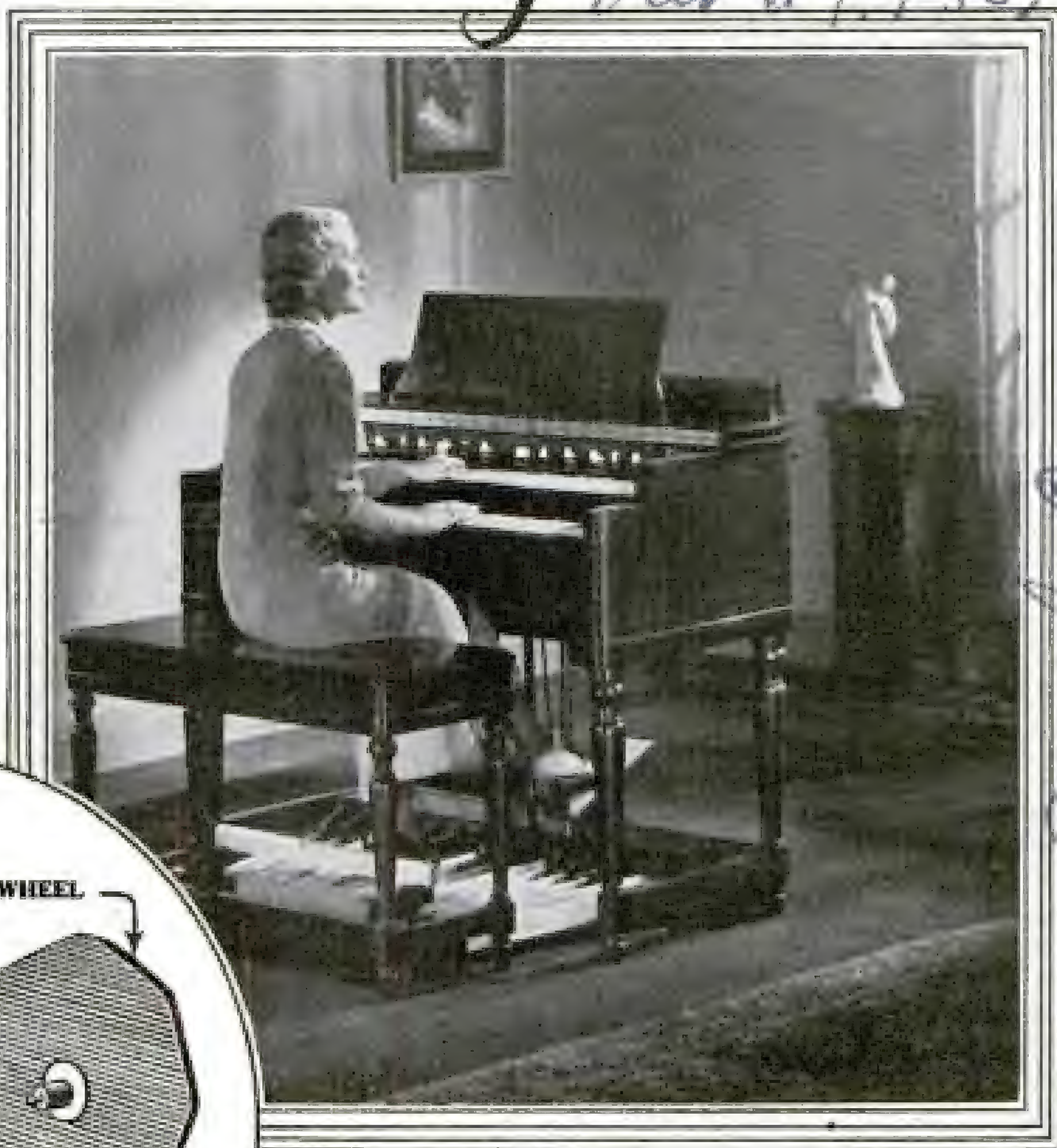


814 98 Export handled by  
New York Office  
50 W. 59th

# Electric PIPELESS ORGAN has MILLIONS of TONES

Pat. 1,956,308

**S**MALLER than a piano, a midget in comparison with the vast pipe organs of traditional style, yet capable of 253 million different tones is the electric organ invented by Laurens Hammond of Chicago. Pipeless, it can match in volume of sound the greatest pipe organs. Without reeds or trumpets, it can simulate an infinite variety of musical instruments. Its mainte-



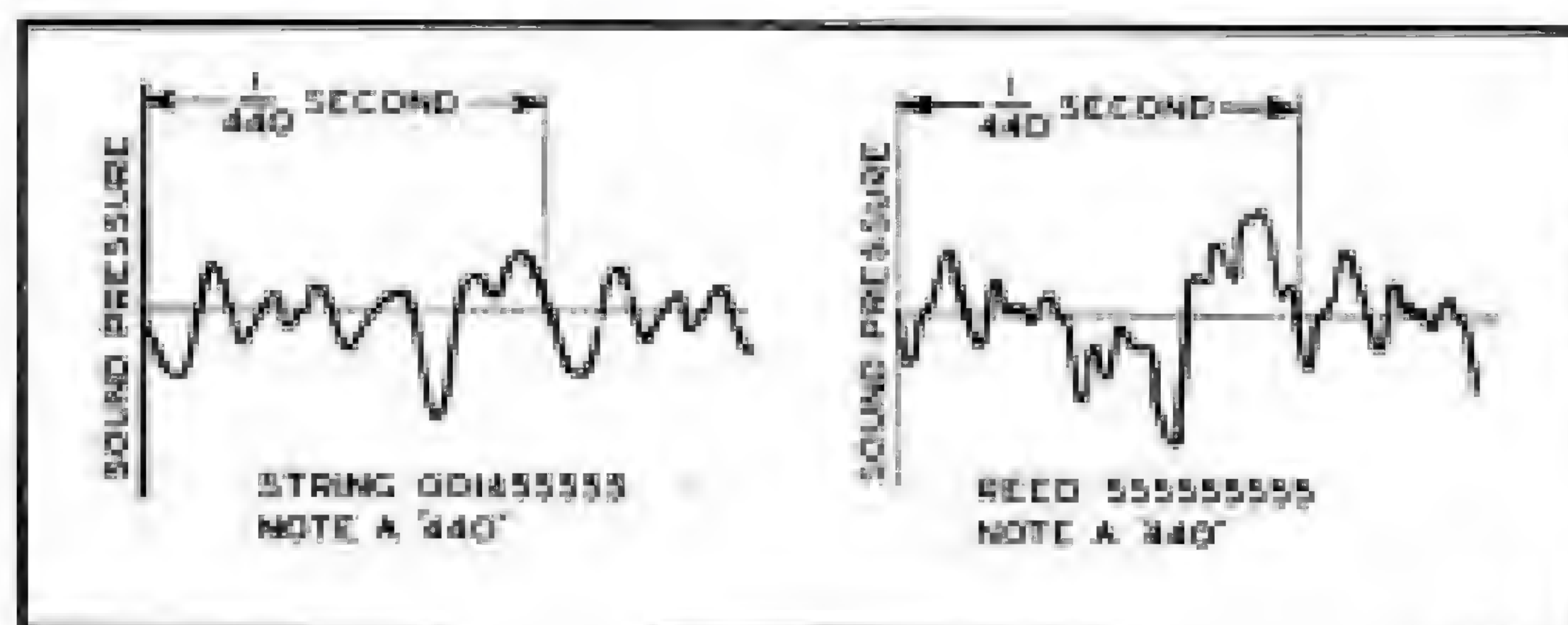
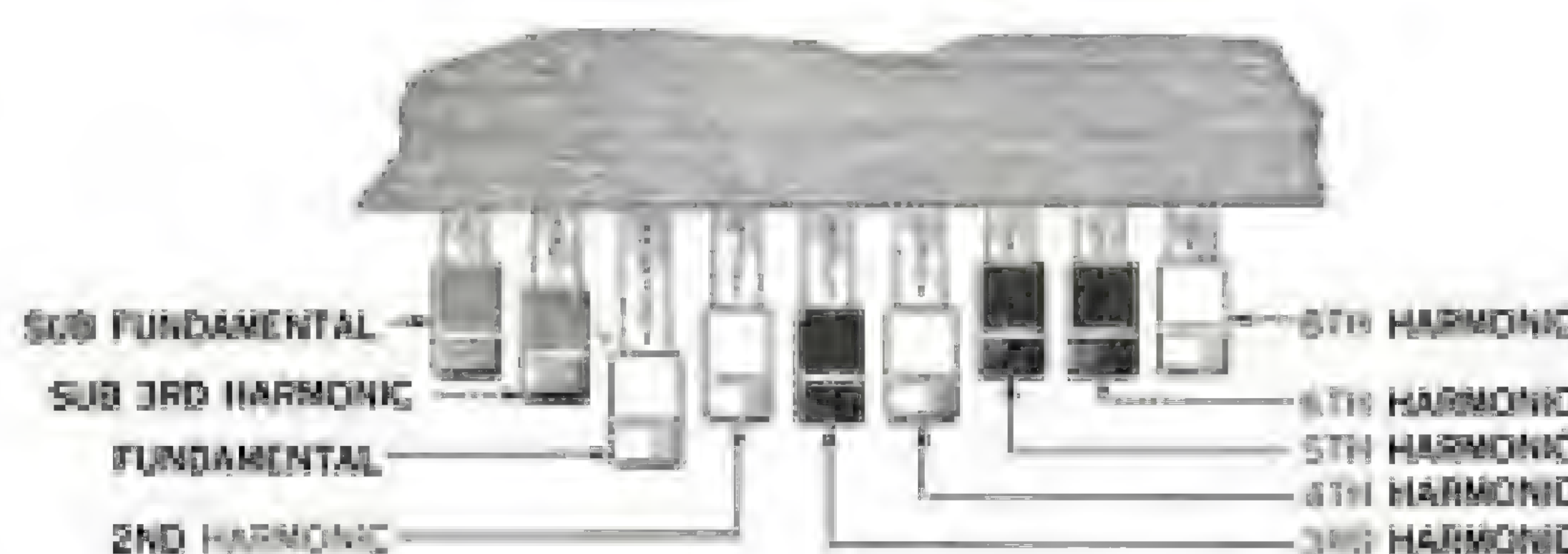
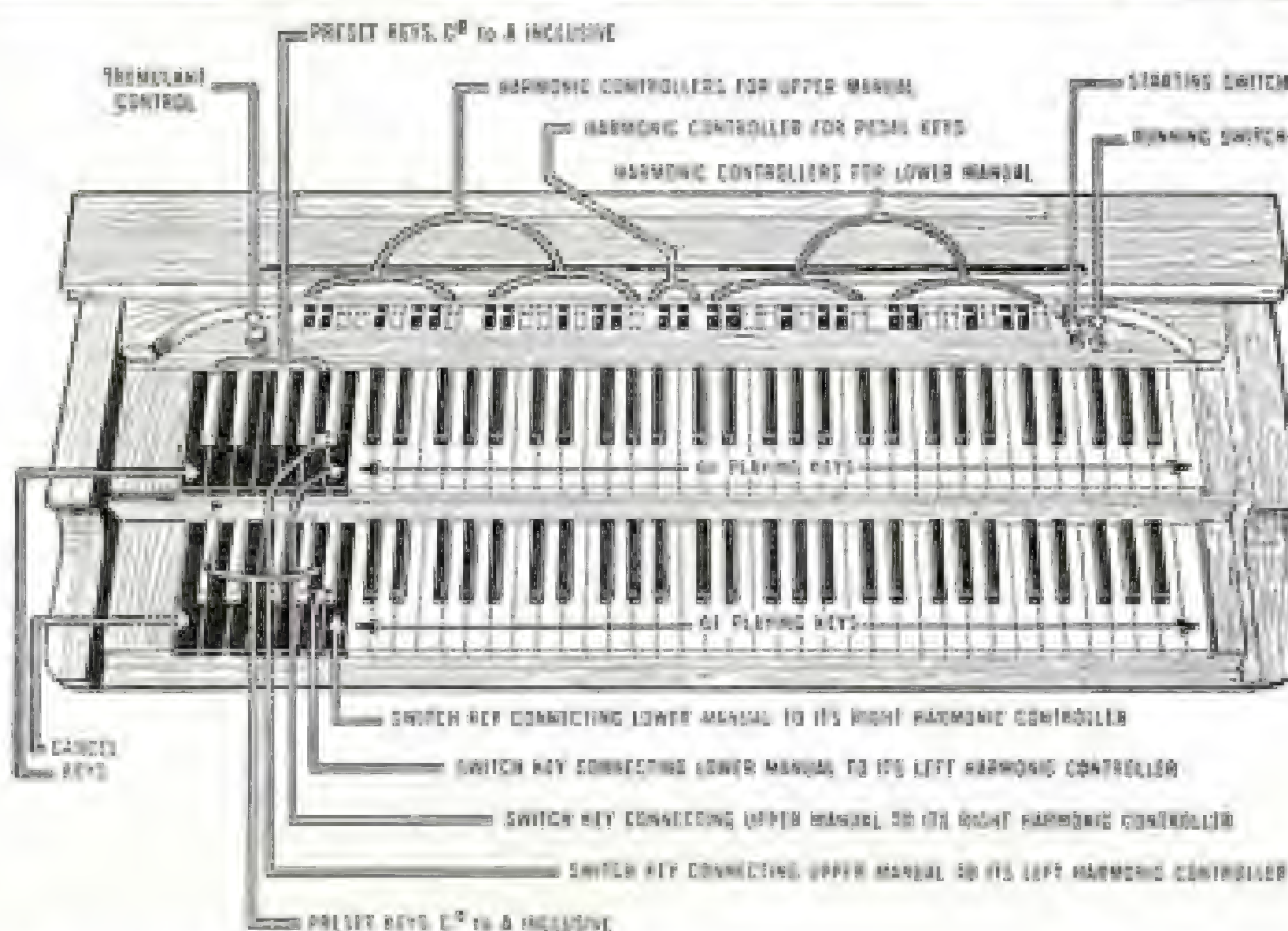
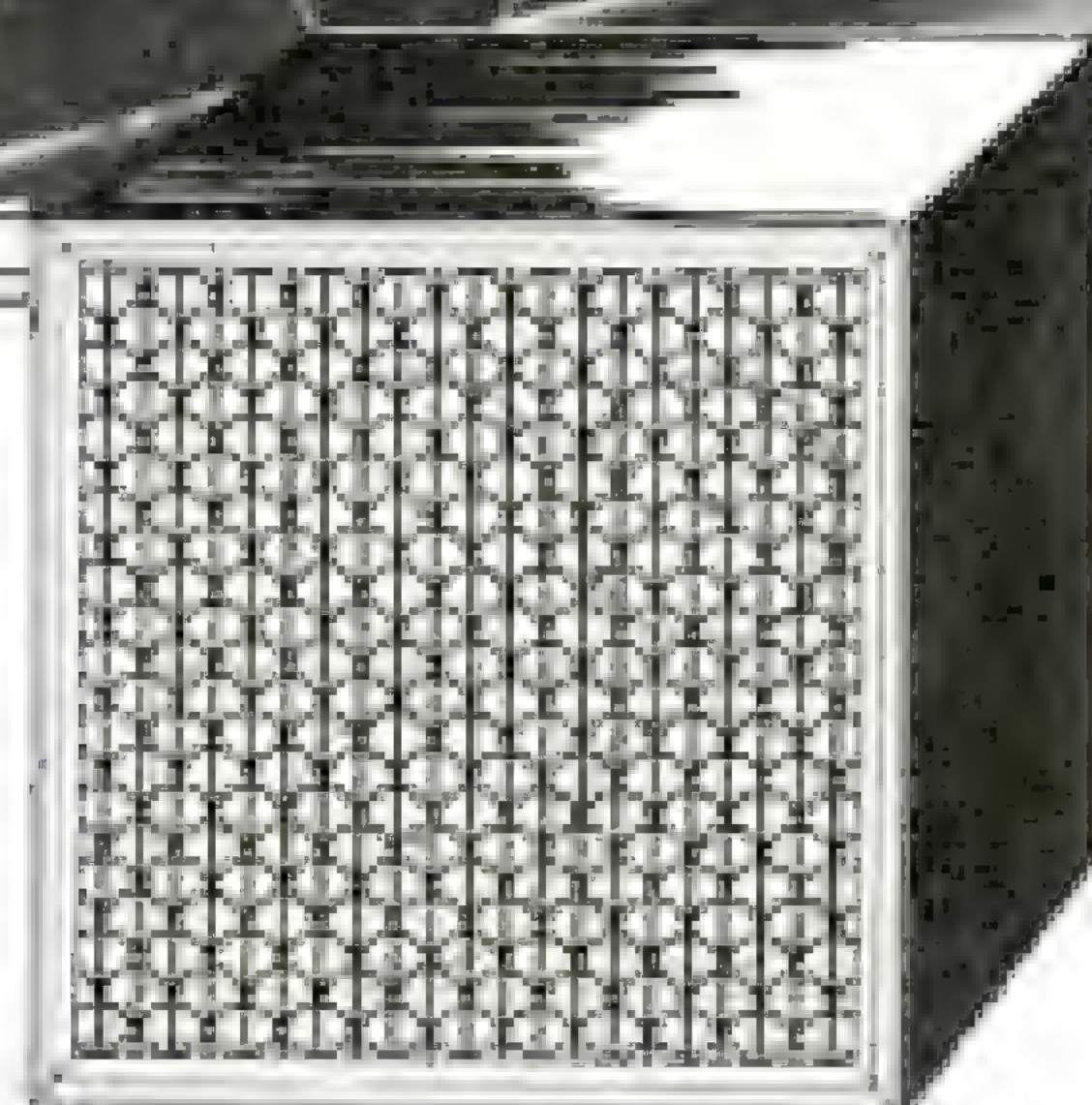
This compact pipeless organ, plugged in on house electric circuit, has 253 million tone combinations available. At left are magnet and tone wheel, ninety-one of which, arranged in box below, are driven by synchronous motor

nance cost is that of a radio, standard radio tubes being used not to produce sound but to amplify tones. The synchronous motor which drives the tone generator consumes only ten watts from the house electric circuit; the amplifier requires about 180 watts. Beyond the keyboard, this organ for home, theater or outdoor arena bears virtually no resemblance to musical instruments of the past. Sound is produced, varied, swelled and modified electrically. Heart of the Hammond organ is the tone wheel. It is a metallic disk

about the size of a silver dollar, rotating on a constant-speed shaft driven by the synchronous motor. Adjacent to it is a permanent magnet about one end of which a coil is wound. The tone wheel has a number of humps or high spots placed equidistant around its periphery, and as it rotates these high spots vary the field of the magnet and thus induce a tiny current in the coil. When the disk rotates at such speed that 440 high spots pass the magnet each second, a minute alternating current of a frequency of 440 is generated in the

Hammond Clock Co. Chicago  
2915 N. Western Ave





To amplify electric organ for outdoor theater, extra power cabinets are added. Drawings, from top to bottom, show power cabinet; double manual keyboard; a tone mixture set up on one of the harmonic controls, and graphs of the wave patterns of string and reed, pitch "A"

coil and its circuit. Heard over the headphone, this frequency is the standard "A" pitch of 440 vibrations per second. Disks with more or fewer high spots produce other pitches, and in the organ there are ninety-one graduated disks driven by the same synchronous motor and producing ninety-one notes. Thus synchronized by alternating current, the organ can never be out of tune. There are two keyboards. Above them is a row of drawbars controlling the harmonics, and it is these which give the infinite variety of tone color. Each drawbar can be set at nine different positions numbered from zero to eight, the position determining the presence and intensity of the harmonic associated with that control bar. There are four harmonic control groups, two for each keyboard, and pre-set keys to the left of the keyboards permit the player to set up certain tone combinations before starting to play. Besides the eighteen pre-set keys which correspond to the piston buttons on the pipe organ console, the organist can manipulate the harmonic controls independently into millions of different rela-



21498

F3

tive positions each producing a different tone color. Certain pre-set keys are arranged to produce qualities of the flute, diapason, string and reed families. As the organist presses a playing key, current of the proper frequency flows to the drawbar of the harmonic controller, whose position determines intensity of the frequency. Thence the various frequencies are mixed and flow as a complex electrical wave to a preamplifier in the console and then to the vacuum tube amplifiers in the separate power cabinet, where the current is translated by speakers into musical sound. A small knob above the keyboards operates the tremulant; a foot-pedal controls the swell. Besides the five-octave manual keyboards there is a pedal clavier of two octaves. The organ is unaffected by temperature or humidity. The electric contacts are composed of a platinum-iridium alloy. The keys are of plastics, mounted permanently on aluminum shanks.

## Nine-Lens Aerial Camera Films 600 Square Miles



Stainless steel mirrors arranged octagonally at base throw image on vertical lenses of aerial camera

## Twenty-Four Hour Globe Clock Shows Time in Every Zone

Not only the time but the date in each of the twenty-four time zones of the world is shown on a globe clock invented by Edward R. Fowler of New York City. It is electrically lighted and includes second and minute hands as well as the hours around the world.



This is the mechanism of the globe clock which tells time for all of the hour zones around the earth

With one simultaneous click of the shutters, nine lenses of the latest aerial camera photograph an area of 600 square miles from an altitude of 30,000 feet. The lenses are mounted vertically, eight of them focused upon the image reflected by eight stainless steel mirrors, and spaced equidistantly around the single center lens. These mirrors, of astronomical type and an innovation in aerial cameras, are nine and one-half by five inches and  $\frac{1}{16}$  inch thick, supported on an octagonal steel cone. All nine images from the lenses are projected on a single film with a negative size twenty-three inches square, the entire 200-foot load of film weighing twenty-five pounds and capable of 100 exposures. A telescopic view finder is equipped with drift indicator and an automatic control assuring proper overlap of the nine vertical pictures for mapping purposes, the camera having been built by Fairchild Aerial Camera corporation for the U. S. Coast and Geodetic survey. Camera and accessories together weigh 636 pounds. Its shutters are operated automatically by an electric motor of  $\frac{1}{200}$  horsepower, and once in operation the cameraman needs only keep it level with two spirit levels. A suction pump keeps the film flat.

Woodward & Lothrop  
62-10 Woodside Ave.  
Long Island City, N.Y.

no steel ladder

Wide World



## 'Quake' on Shaking Table Aids in Study of Effects



White outline in foreground is shadowgraph of quake. Tank on table is shaken as equipment converts shadowgraph lines into motion

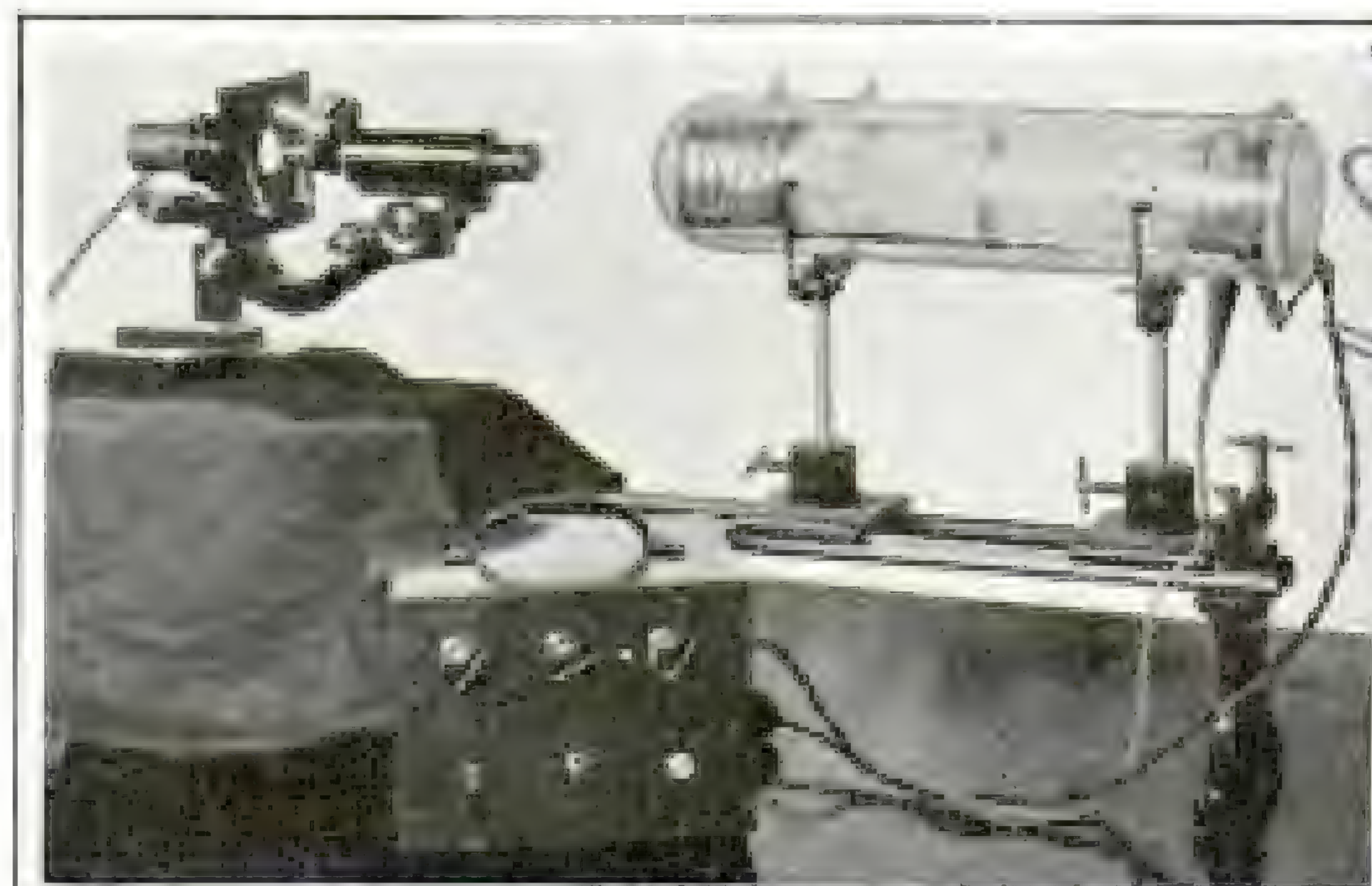
Designed for studying the destructive effects of earthquakes on buildings and other structures, a new type of shaking table duplicates in the laboratory the various temblor motions directly from seismograph records. An electric eye follows the wavy outline of a shadowgraph of an actual earthquake, such as that at Long Beach, Calif., in 1933, a pencil of light being the only connection between the shadowgraph and the shaking table. In one test a scale model of an elevated water tank was erected on the table. Driving mechanism includes an oil-actuated piston which moves the table under the control of a very sensitive, quick-acting valve that

transmits to the piston every detail of the earthquake waves as they are seen on the shadowgraph by the electric eye. The machine makes it possible to determine just what might have happened to a full-sized water tank in the Long Beach temblor.

## 732 Magic Tube Sends Movie Through Dark Glass

Motion pictures can be projected through black glass and microscopic organisms seen with invisible light by means of an electron tube being demonstrated by the Radio Corporation of America. The tube converts light rays into electrons. With the ordinary light beam of a movie projector focused on the tube, electrons speed through the tube and reproduce the pictures on a screen. When a dark glass interrupts the light beam, the motion pictures continue as if by magic, for the tube is functioning on infrared rays, known as "black light." In the electron image tube, pictures

are focused electrostatically by means of a potentiometer. The tube may also prove



Microscope set up for study of cell tissues by infrared light of electron image tube

Mass Institute of  
Technology  
Cambridge Mass

RCA Bldg. 30  
Rockefeller Plaza

New York City



*Demonstrated by Dr. O. K. Zworykin and Dr. George A. Morton.*

a valuable tool in microscopic studies. Tiny organisms now are observed through the microscope by using intense light or stains that sometimes kill the germs. With the electron image tube the student may see details of cell structure and tissue visible by infrared light more clearly and with less harm than by ordinary light. Again, the tube may be employed in an "electron telescope" by which man can see through atmospheric haze, for infrared light waves travel through fog that reflects and deflects visible light.

### Thirty-Five-Ton Granite Cross Cut from One Piece of Stone

Cut from a single piece of stone, a thirty-five-ton granite cross recently was completed at a Vermont quarry and prepared for shipment to Chicago where it will be erected in a cemetery.



Granite cross weighing thirty-five tons which was cut from a single piece of stone

### Detachable Airplane Wheel Replaces Tail Skid



It takes only a few moments to bolt this wheel with pneumatic tire to the tail skid of a plane

To convert airplane tail skids into pneumatic-tired wheels for landing on hard surfaced runways, a detachable tail wheel has been designed. It is inexpensive, and can be bolted to the skid in a few minutes.

### Whales Tagged with Numbers to Study Migration Habits

Numbered metal disks are placed on fish to study their habits but numbering whales to find out about their migration presented difficulties to a research ship in the Antarctic. The problem was solved by using numbered aluminum darts ten inches long. These are fired into the whales with the aid of a specially designed gun. The dart enters the blubber of the whale and does not cause inconvenience. A record is kept of the locality in which each dart is fired and a reward is offered for the return of the dart if the whale is caught. In this way the migrations of the whales can be followed.

*Falkland Islands Government*

*Developed by Dr. J. Cowland.  
at Birmingham, Ala.  
at London.*

*Ant. Harold A. Lord of Hartford, Conn.*

*F 10*

*F 44*

*at Burre*

*F 37*

*June 11/24/35*

*Johannesburg Sunday*



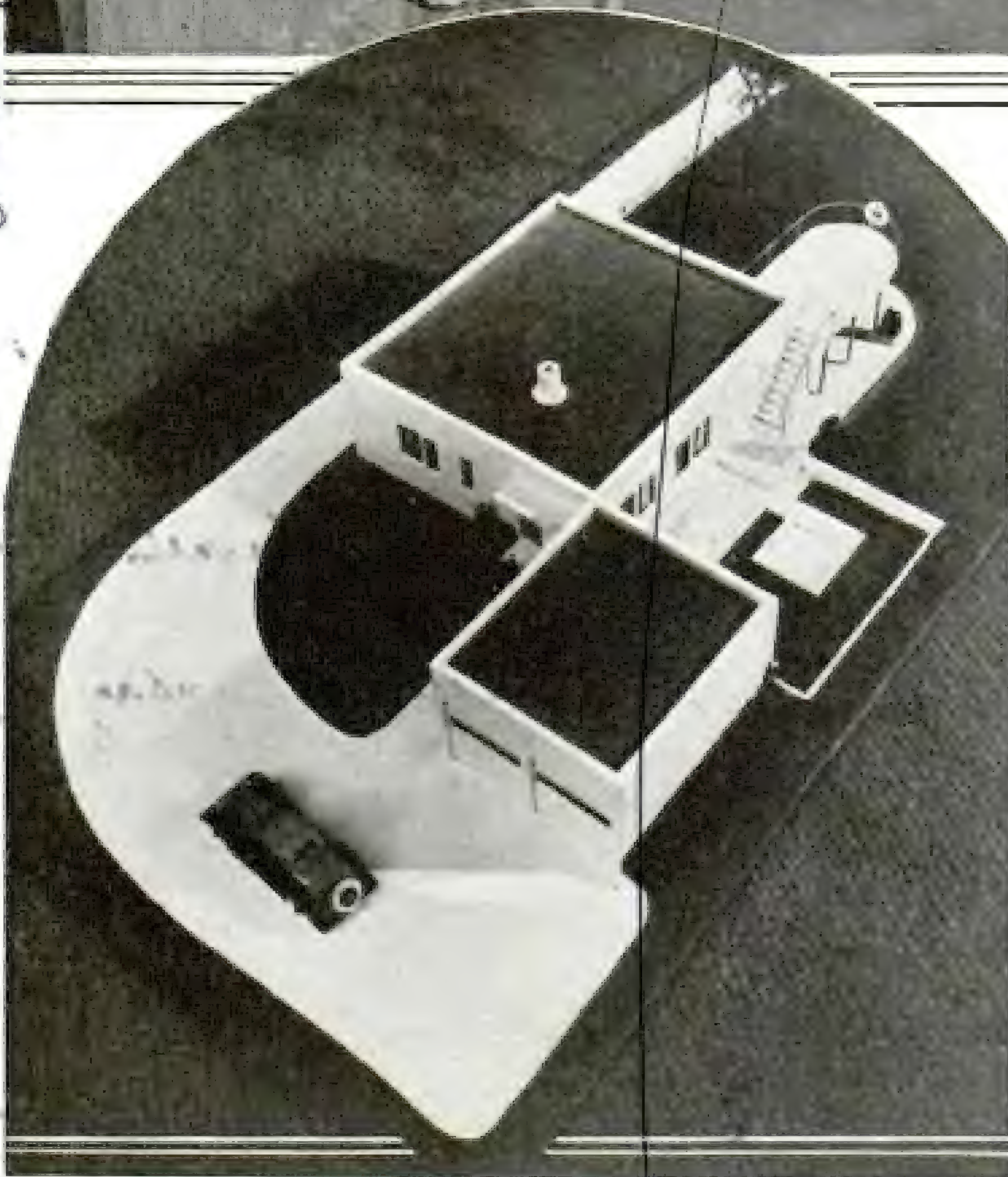
8-12-68.

Cmt. Walter E. Burton  
1032 Florida Ave  
Akron, Ohio

# MODERN FACTORIES



THOSE who study architecture are expected, as a matter of course, to be erecting houses and factories and office buildings in due time. But, in Akron, O., is a man whose architectural interests have led him to the building of table-top models which provide a glimpse of the kind of structures that business, industry and the average fam-



ily will occupy in years to come.

Robert Wise has found a business in making cardboard factories, surrounded by rubber-sponge hedges and poplar trees made from dried goldenrod plants. For many years he had been interested in models. He liked to build miniature replicas of various kinds of things. He studied architecture—then went to work for a company that deals in financial securities. After 1929 it became increasingly difficult to find people who wanted to buy securities and Wise found himself with a lot of time on his hands. He spent much of it painting in oils, and making and reading about models.

About two years ago, a friend who admired

Robert Wise working on model of tourist hotel, and his model of a modern residence from which a full-scale house was built. Such models often save costly alterations later

203 Astorwood  
Road



# Built on TABLE TOP



Wise's model work suggested he visit a Cleveland company that specializes in fabricating factory buildings, power houses, gasoline stations and other industrial structures. That company, the friend explained, sometimes hires people to make models. Wise went to Cleveland and met a man who was "tearing his hair" because he was expected to have a photograph of a factory building ready in two days and the building hadn't been erected yet. A model

*Top, factory model complete even to landscaping. Center, model constructed to give impression of great depth. Bottom, factory model illuminated to show appearance at night*





*Left, model of a bus terminal. Mr. Wise had to construct the miniature busses because none of the scale necessary was available on the market*

had been suggested but the photographer knew nothing about model making.

When Wise explained that he could read blueprints and make models, he was put to work. In less than a day, the model was completed. The photographer made a picture and at the appointed time the desired print was delivered. That was the incident that transformed Wise's pastime into a paying business. Since then, he has built dozens of model factories, most of them for use in making photographs for advertising and publicity work.

He makes his factories from a good grade of cardboard, glue, bits of composition roofing and whatever other materials are suitable and convenient. Most of the buildings are painted to resemble enameled steel, the material of which similar full-size structures are built. Sometimes Wise works from blueprints, reducing them to the desired scale. At other times, he is given merely a rough sketch and works out his own details. In all this, his architectural training has proved invaluable as have his artistic abilities—knowledge of pigments and paint materials.

The cardboard buildings are put together so they are strong enough to withstand considerable handling, for they frequently are sent to various parts of the country for

(Continued to page 132A)



*Above, part of a model southwestern town. Bottom, electric power station as visualized in cardboard to show builders appearance of structure before it was built*

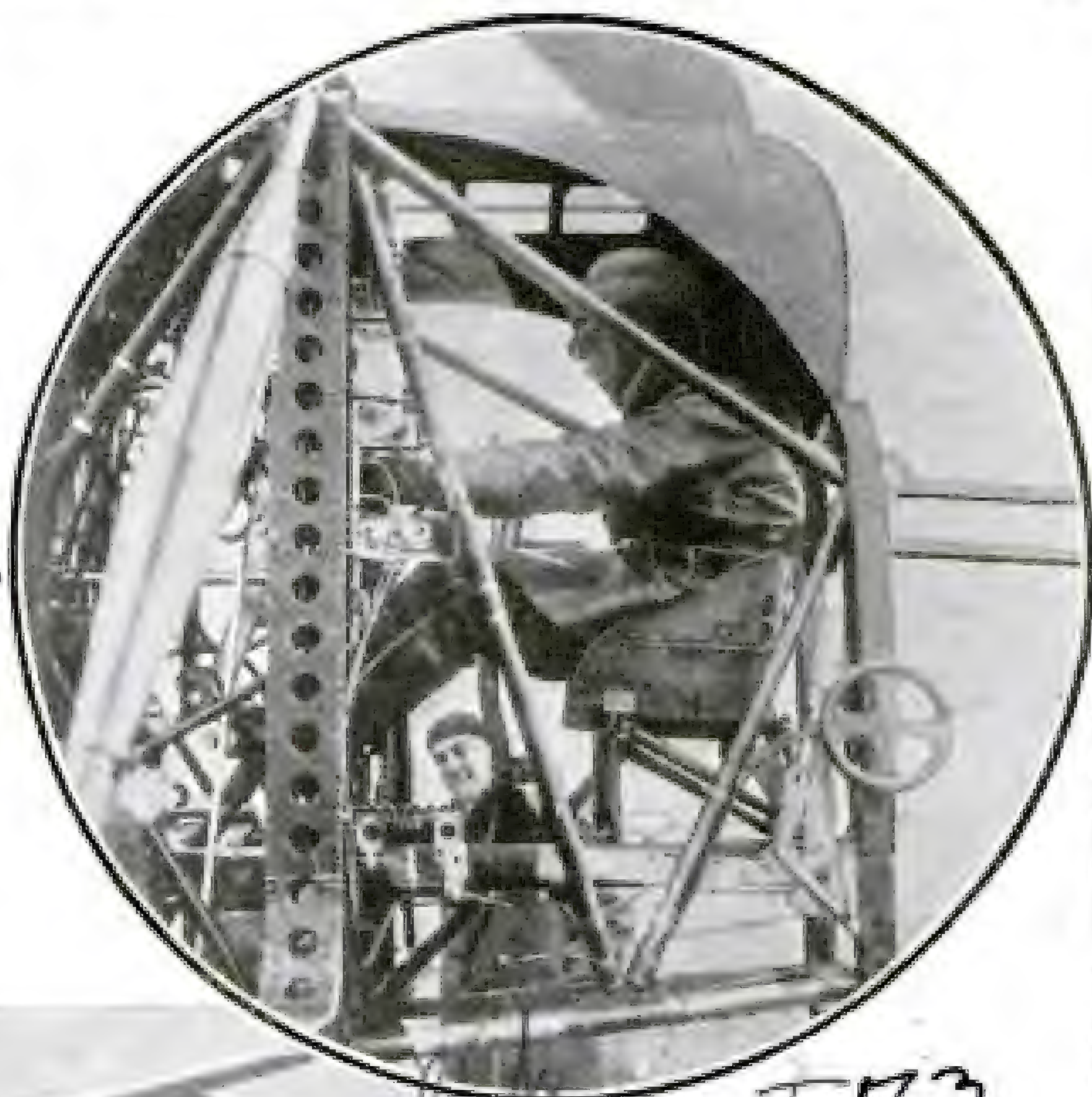


21603

# Twin "Windmill" Blades Fly Wingless Ship

Great whirling "windmill" propellers are mounted tandem over the pilot's head on a wingless airship undergoing tests in France. One of the horizontal blades sustains the ship in flight and the other propels it forward. Besides the traditional three-point landing gear the gyro has a small wheel under the nose. Pilot Maurice Claisse gave the ship extensive tests, successfully demonstrating its ability to lift off the ground and remain in the air. Its wide-set wheels are joined to the body by steel framework.

Two views of the wingless French aircraft. Observe the intricate mechanism surrounding the pilot's seat



## F73 Air Springs Replace Metal Leaves for Automobiles

Air springs consisting of bellows have been tested successfully in automobiles, replacing the ordinary metal leaves heretofore used. The air springs are described by R. W. Brown of the Firestone Tire and Rubber company as resembling two hot-water bottles placed

one on top of the other. Through tubing they connect with an air reservoir and the bellows and reservoir are filled with air to a predetermined pressure. Road shocks cause the air to pass back and forth between bellows and reservoir. Tests have indicated the rubberized fabric material in the air springs will stand 8,000,000 two-inch deformations under twenty-five per cent overload. Body roll on curves is eliminated by using a small pendulum device hung inside the air spring. This controls a valve mechanism and by valve action the air pressure on the outside springs is maintained at a higher level than on the springs toward the inside of the curve.

## 754 Flat Chest Linked to Mind in Intelligence Tests

If your chest is flat, you probably are more intelligent than that fellow with the deep chest. From studies of several thousand adults and school children, Dr. S. A. Weisman of the University of Minnesota concludes that flat-chested persons not only average more intelligent than the full-chested, but are taller and heavier. In earlier surveys Dr. Weisman found that, contrary to popular belief, flat chests are not an evidence of tuberculosis, but that deep-chested individuals are more prone to the disease.

Scene Service  
1/10/36

Minneapolis  
Minn

Scene Service  
1/13/36

Akron Ohio.  
see May 19 36 693

at meeting of  
S. A. G.



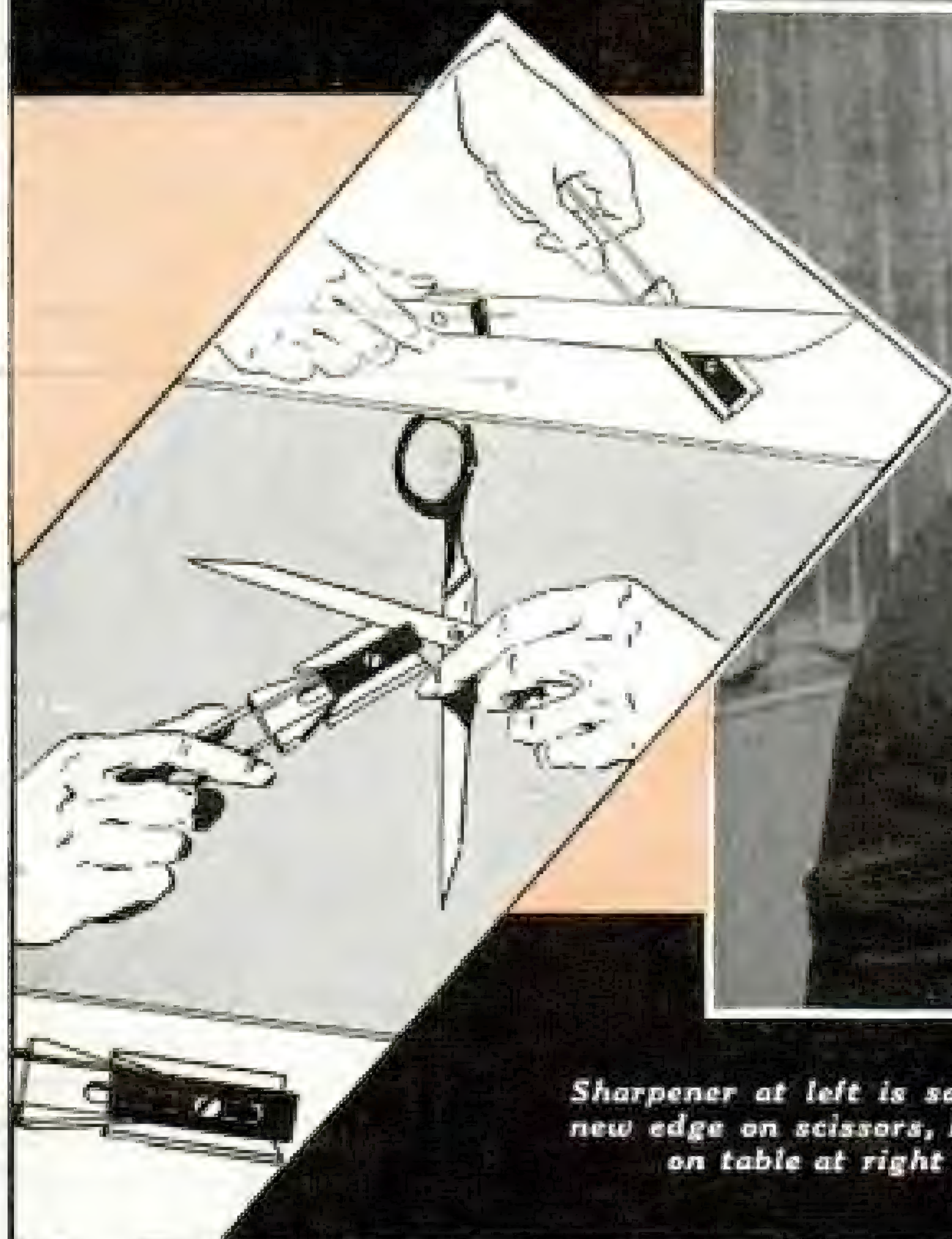
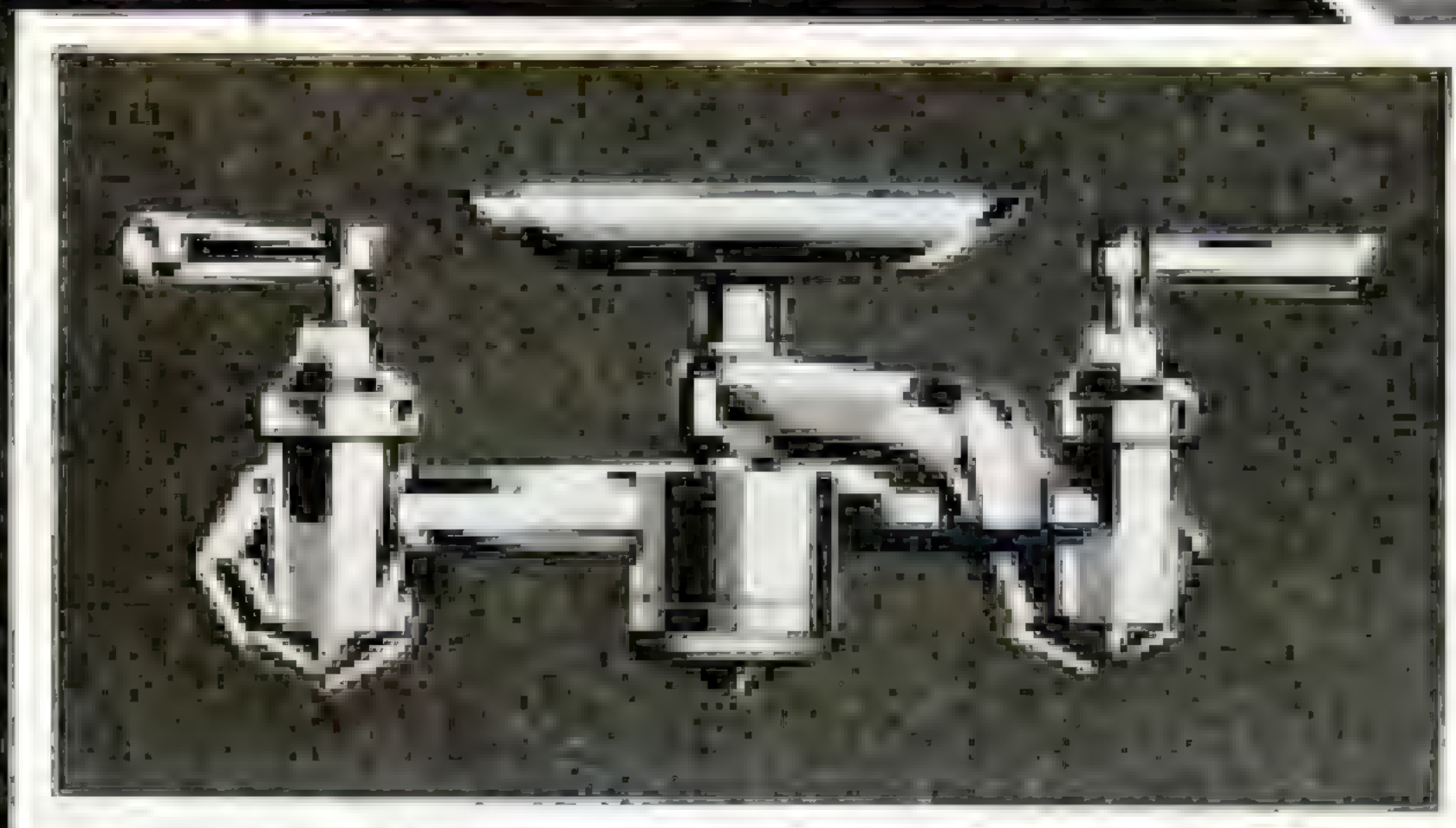
# New Conveniences YOUR



Bridge lamp, above, has horizontal tube bulb extending over table without interfering with players. Porous stone encased in water faucet at right filters out germs and foreign particles



At each end of the day-enport, above, are convenient shelves and compartments for books, beverage set and radio

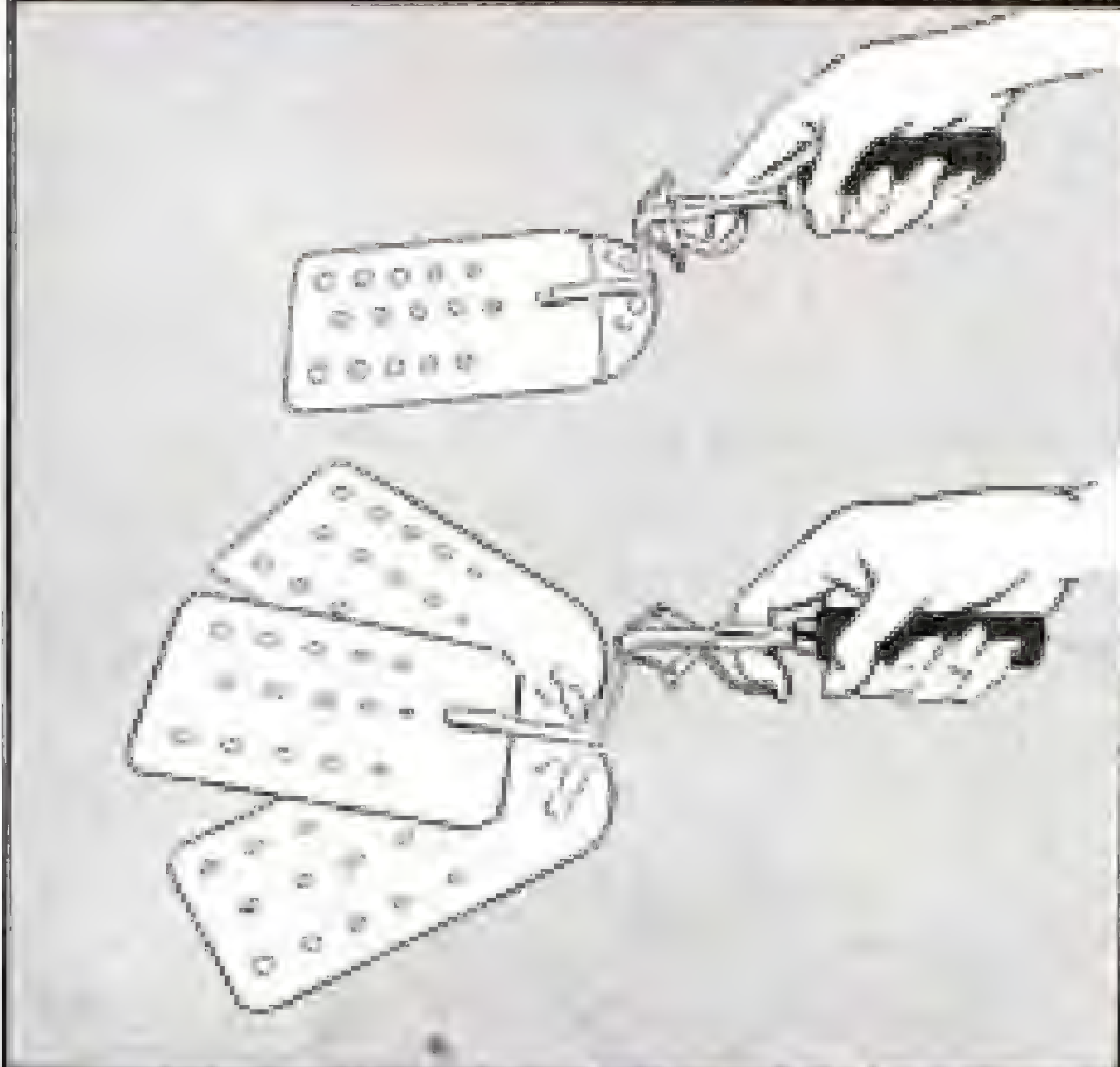


Sharpener at left is safe and can be adjusted for putting new edge on scissors, knife, or skates. Pocket-sized meter on table at right tells how much light you need



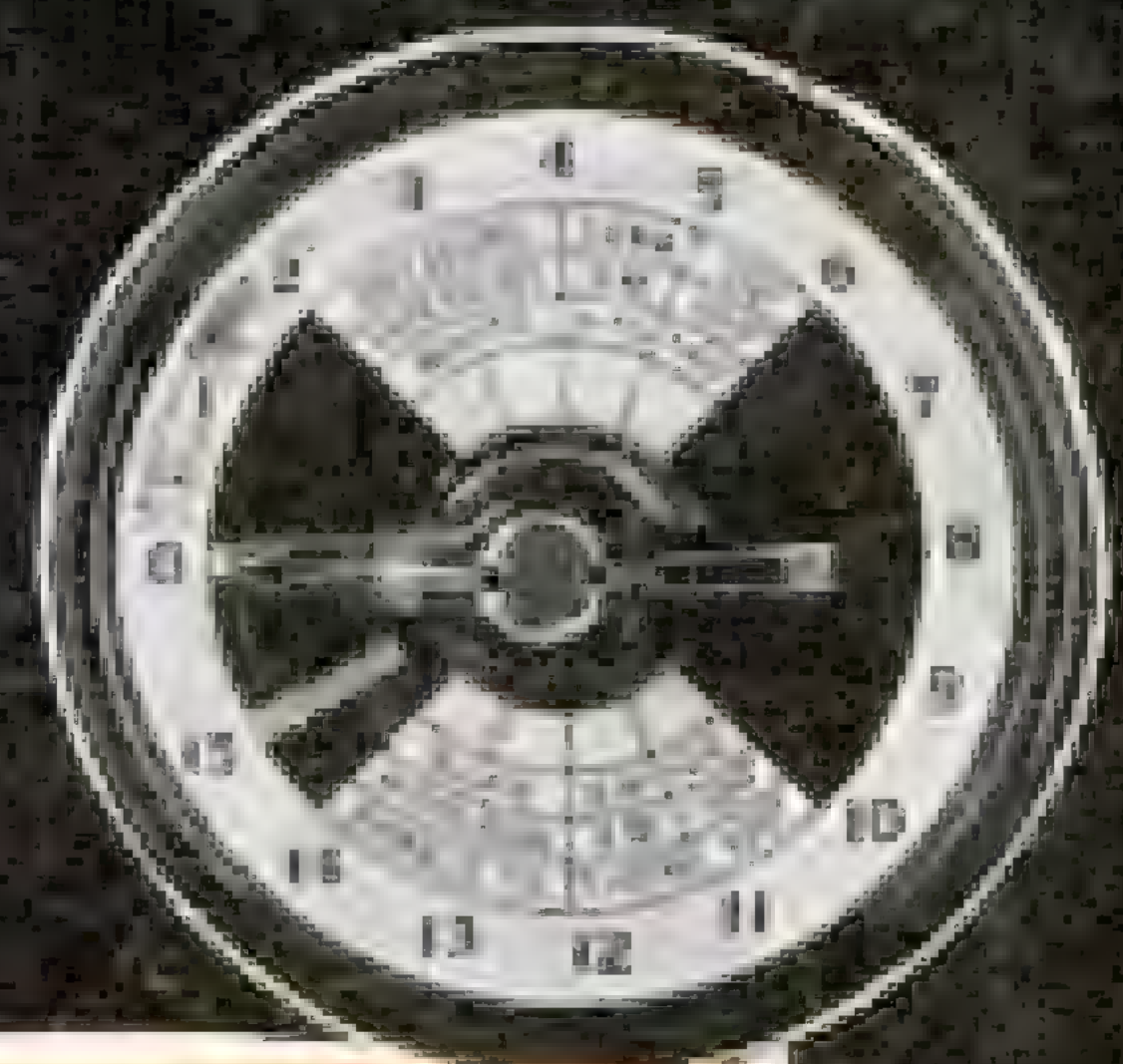


# for . . . HOME



*Adjustable flapjack ripper, above, can be slipped under steak and spread into three-bladed lifter by pulling trigger*

*Left, decorative bracelet has detachable pendant holding ball of yarn for knitting. At right, time control dial for household washing machine tells proper water temperature and time for washing various fabrics, and switches power off automatically*



*Adjustable quilting frame can be tilted or turned upside down and the quilt may be stretched tight or loosened by winding the two rollers*



## Six-Million Volt Atom Smasher Creates New Elements



This eighty-five ton "cyclotron" creates new radioactive elements by smashing atoms

Artificially radioactive elements, hitherto unknown, are being created by the "cyclotron," giant atom-splitting machine at the University of California, whose power has been stepped up to 6,000,000 volts or more. A score of elements have been transmuted into other elements, some well known but others not previously recognized on the earth. The radioactive substances give off emanations for a few days, or only minutes, whereas radium is active for thousands of years. The cyclotron weighs eighty-five tons, and permits discharge of more than 100,000 billion fragments of double-weight hydrogen atoms per second. One of the research fields in which the cyclotron will be used is the development of the neutron ray, far higher in energy and penetrating power than the X-ray.

## Two Time Zones for Nation Proposed Instead of Four

Radio, airplanes, telephone and telegraph lines have so annihilated time that the suggestion is being made that the United States be divided into two time zones instead of four. The present eastern, central, Rocky Mountain and Pacific standard time zones were adopted in 1883 to end the confusion of "sun time" in every city. Railroad time schedules were a

coordinating influence then. Now Bern-rose Boyd of the University of Iowa proposes one time zone east of the Rockies and another for the west. The east would adopt what is now central standard time, and the west would be three hours later.

## Language-Teaching Machine Plays Charted Records

Learning foreign languages, music and correct speech is made easier by a machine with controls by which words or sentences or musical passages selected from a printed lesson chart may be produced in sound. Lesson chart and the record are correlated so that any word or sentence can be selected and repeated automatically as many times as desired. The machine is a phonograph-radio combination, with the controls for playing the instrument at any point on the record. Charting the disks can be done at home or in the class room. The machine may be



Printed passages may be played and repeated at will by setting indicator of this machine

adapted to any textbook by making recordings and preparing charts. Called "translaphone," the instrument operates on alternating or direct current and uses any standard phonograph disk.

## We Beg Your Pardon

William Priess is the sole inventor of the television scanner described in the February issue of Popular Mechanics Magazine. Dr. Lee De Forest, who was mentioned as co-developer of the scanner, asks that full credit be given Mr. Priess. Popular Mechanics is glad to make this correction.

Science Service  
12/31/35





*Adapters  
for using*

# ALL-METAL TUBES..

*23698*

**I**F YOUR receiver has a tube listed below in the first column you can substitute the corresponding metal tube indicated in the second column in a few seconds by means of a suitable adapter. Although the new metal tubes require an entirely different type of socket, these adapters are designed to solve the problem in a very simple manner. The base of each adapter has the same number of prongs as the glass tube which is to be replaced; the standard octal socket for the all-metal tube is built into the top of the adapter.

There are no changes required in the set, simply place the new metal tube in the adapter, as shown in the upper photo, and insert it in the socket previously occupied by the old-type tube.

Besides modernizing the receiver, these adapters in r.f. circuits permit greater stability and better selectivity due mainly to the reduced interelement capacitances of the metal tubes and the greater effectiveness of the steel shell shield. The adapters entirely eliminate the tube shields used at present. No ground connections of any kind



are necessary, as this is effected within each adapter.

When using the 6A8, 6B6, 6J7 or 6K7 metal tubes which have the new miniature caps, it is necessary to use a small metal clip on the top of the tube so that the larger grid clip, used on the old tube, will fit. These

adapters not only provide the set owner, and experimenter, with a simple means of improving their receivers, but they are

also useful to the service man who wishes to bring his tube tester up to date. They may be used to check the metal and octal-based tubes of various makes, in the tube checking sockets that are indicated for the tubes in the first column. Each adapter is color coded for easy identification.

Old Tube Replaced	New Metal Tube Used	Base of Adapter
80	5Z4	4 prongs
76	6F5	5 prongs
75 triode	6F5	6 prongs
37 or 76	6C5	5 prongs
41 or 42	6D5	6 prongs
77 or 6C6	6J7	6 prongs
78 or 6D6	6K7	6 prongs
41 or 42	6F6	6 prongs
75 or 85	6B6	6 prongs
6F7	6P7	Small 7
6A6	6N7	Large 7
6A7	6A8	Small 7

*Alden Products Co.  
715 Center, Brockton  
Mass*



# GENERAL PURPOSE



By M. N. BEITMAN

**A**N INTER-ROOM communication system saves time, patience and shoe leather; you merely push a button to talk, and release it to listen to a person in another room. It may be used between the front and rear rooms, or the first and second floors of a home. It is also suitable for inter-office communication; paging and

calling; between store and stockroom; house and garage; sickroom and nursing quarters, and many other useful applications that will suggest themselves to the builder.

The system to be described is very compact and may be transferred easily from one location, and application, to another. To place it in operation it is only necessary to plug the line cord of each unit into the nearest a.c. 110-volt wall socket, turn on the switch and advance the volume control about

half-way on. The 4-wire connecting cable may be any length up to 200 feet.

Two identical units are required. They are housed in neat cabinets made of plywood, the dimensions of which are given in the sketch. Holes are cut in the front of each cabinet for mounting the 5-in. speakers, lapel-type single-button microphones and pilot lights. The larger holes are backed with gold cloth and any type of speaker grill may be used; however, the four narrow wood strips shown answer the purpose. The original cabinets were finished in dull black and the strips were given a coat of gilt lacquer.

Schematic circuit diagram, Fig. 1, is exactly like the one used for the No. 2 unit except that the color-coded cable connections are reversed for the type-38 tube and speaker in the No. 2 unit just as indicated

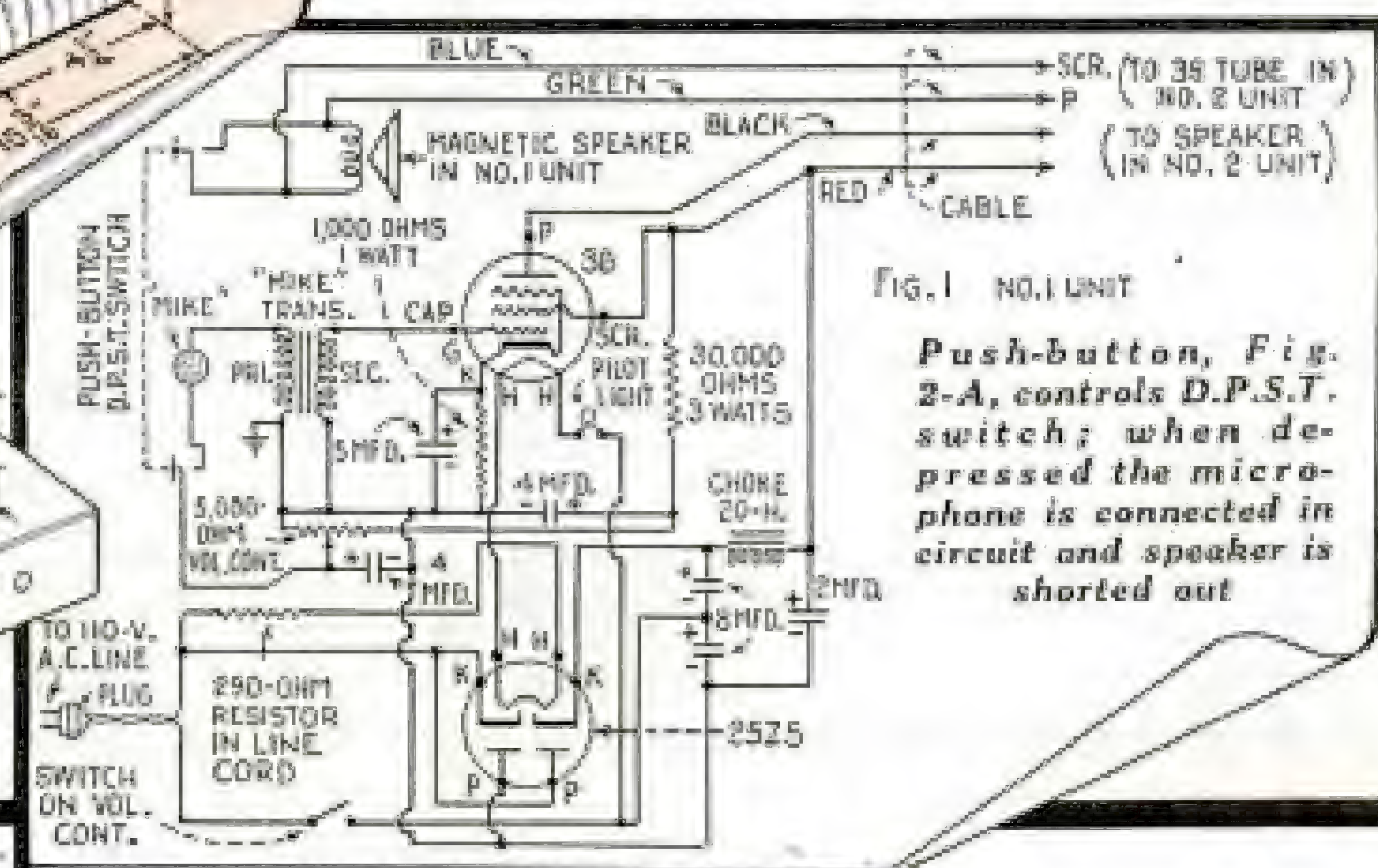
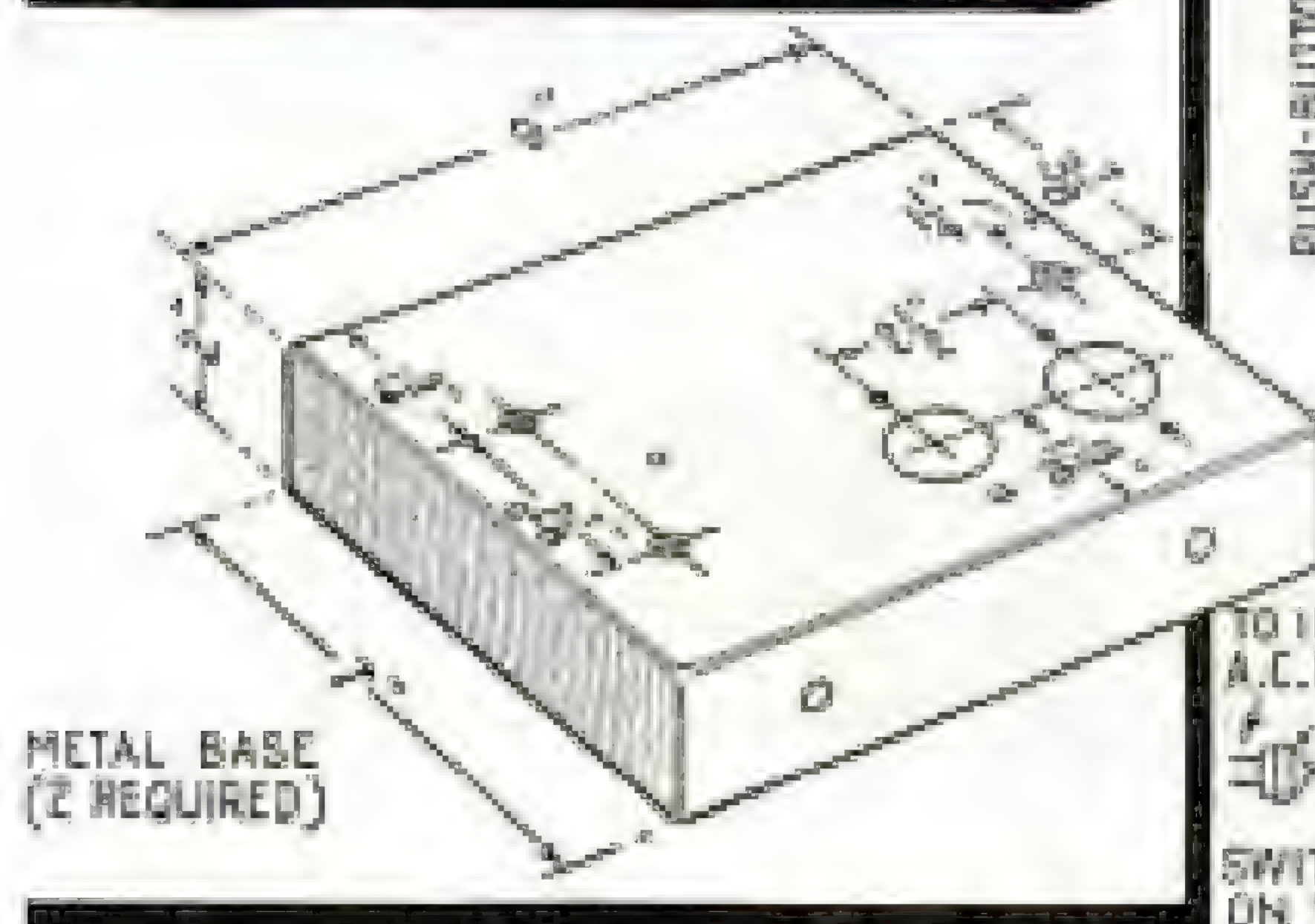
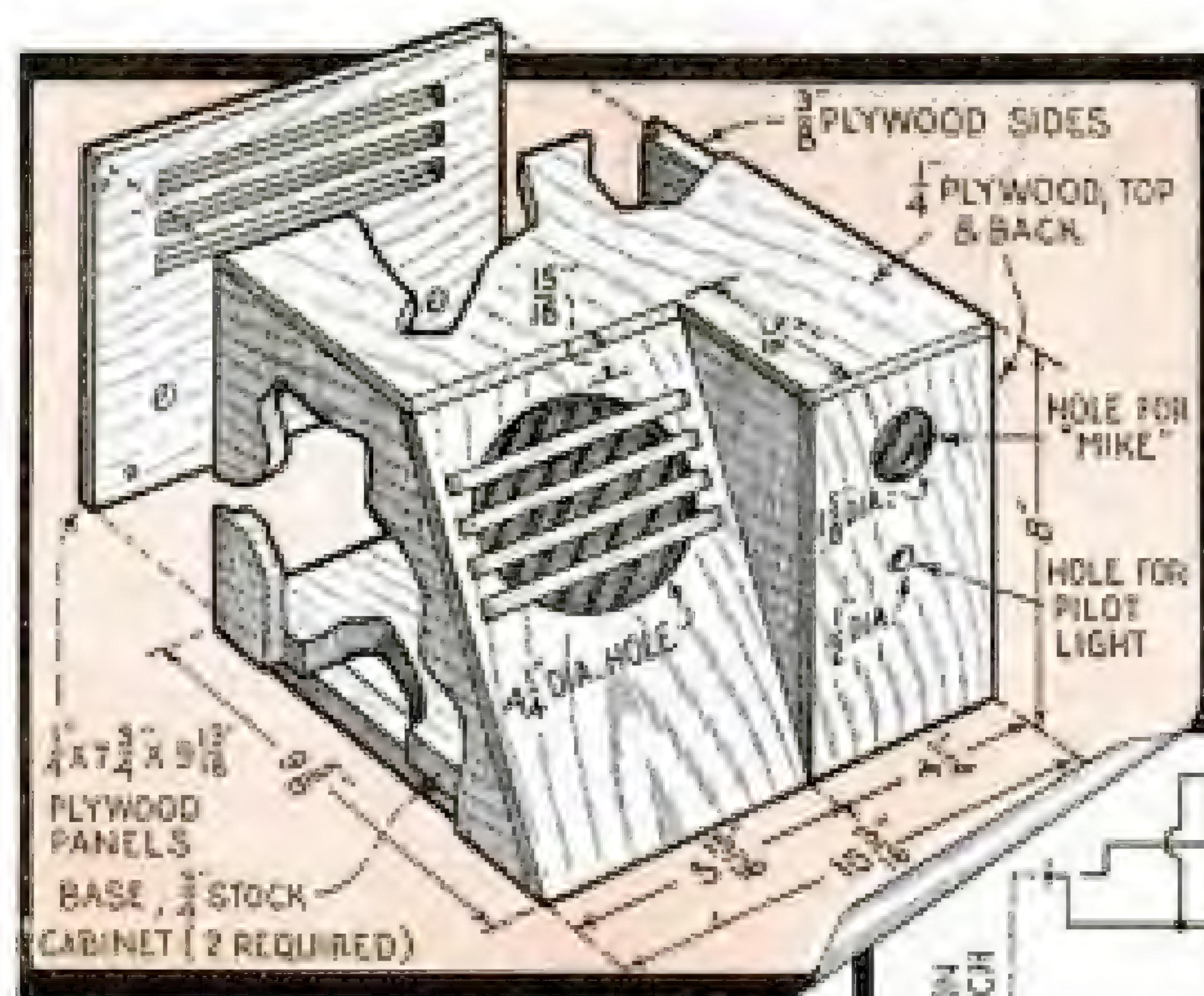


FIG. 1 NO. 1 UNIT

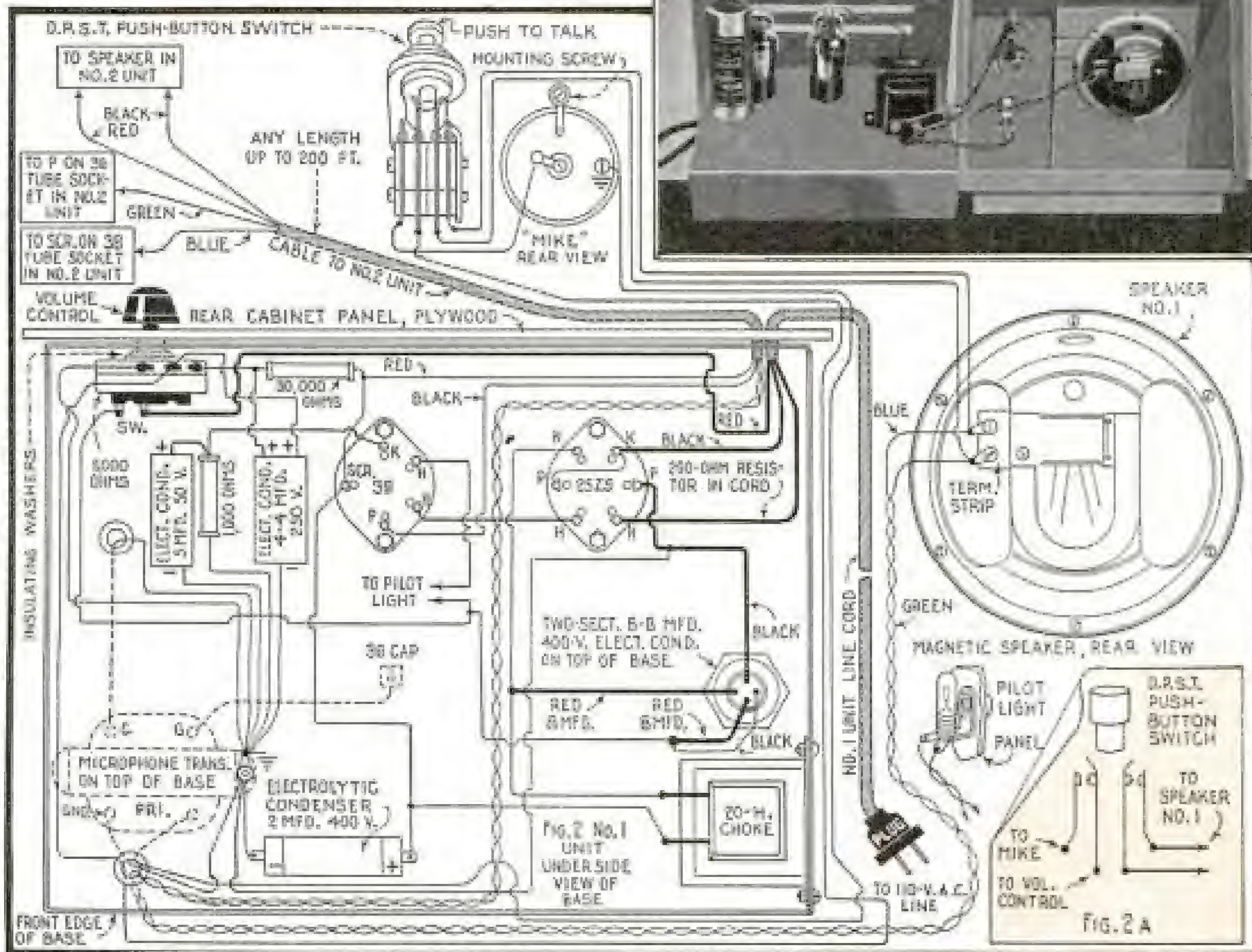
*Push-button, Fig. 2-A, controls D.P.S.T. switch; when depressed the microphone is connected in circuit and speaker is shorted out*



# INTER-ROOM *Communication* • • • *System*

in the simplified wiring diagram, Fig. 2. It will be noted that the circuit consists of a type-38 single-stage audio amplifier, the power supply for which is derived from a 25Z5 rectifier tube in a voltage-doubler circuit. These tubes and their associated parts are mounted on the metal bases detailed at the left of Fig. 1. The filament of the 38 tube is connected in series with the pilot light and the filament of the 25Z5 rectifier. All of these require .3 of an ampere. The line voltage is

(Continued to page 136A)





# Simple Amateur Radiophone for 160 Meters

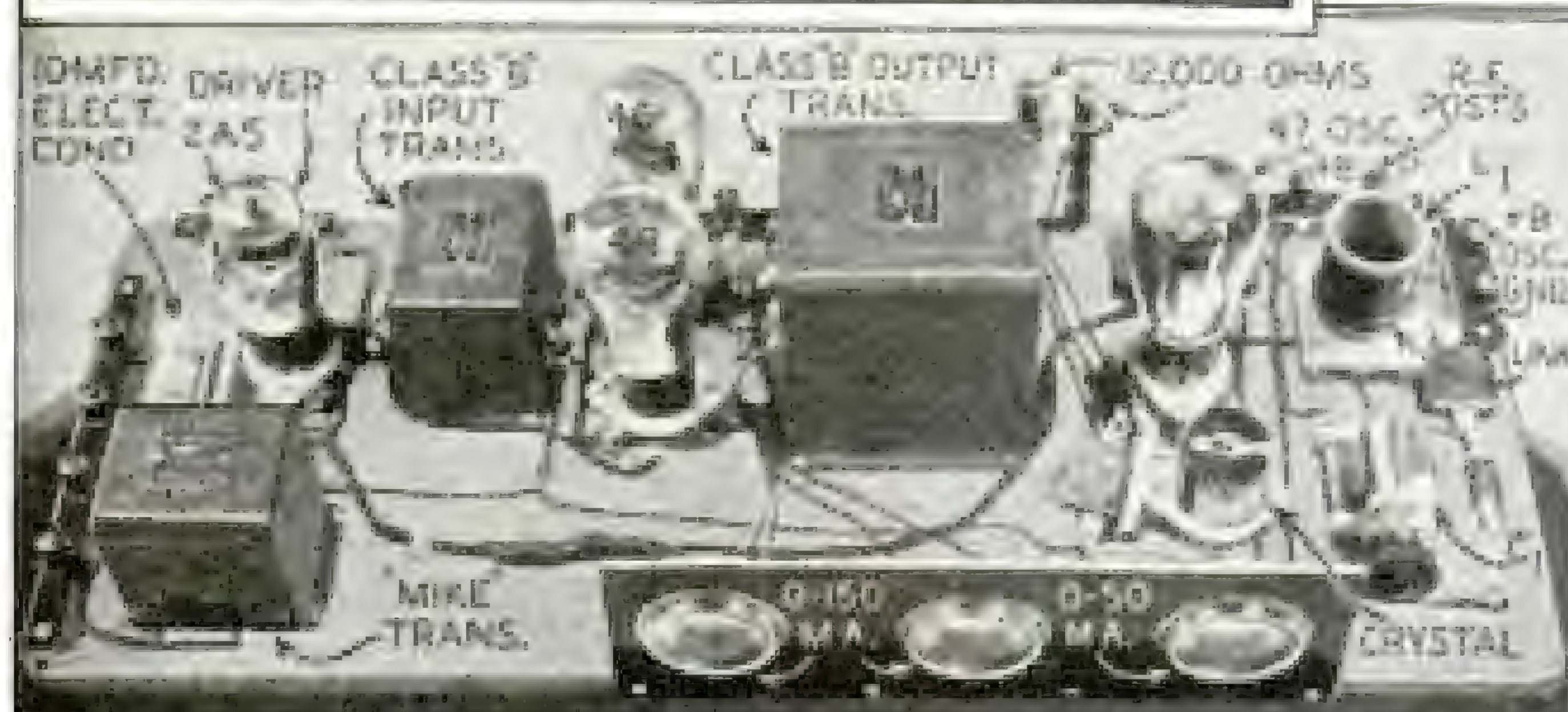


ally some real DX of 1,000 miles or more can be worked with moderate power on this popular band.

The baseboards, for the units shown in the photos, are  $\frac{1}{2}$  by 9 by 24 in., cut from a standard 18 by 24-in drawing board. They were given a coat of orange shellac and mounted on rubber-headed tacks. All wiring is above the baseboards.

A type-47 tube is used for the crystal oscillator, the schematic diagram of which is given in Fig. 1. This section is mounted on one end of the board shown in the upper photo, and the rest of the board is reserved for the modulator and speech-amplifier equipment. The coil socket for  $L_1$  is mounted directly behind the 21-plate midget tuning condenser  $C_1$ ; this socket is a National 6-prong coil socket, and  $L_1$  is a National No. 65 plug-in coil of the same type as used in the "SW-3" short-wave receiver.

There are no changes in the coil whatever. A link coil consisting of two turns of insulated wire is placed around the bottom of this coil, loose enough so that the coil may be removed from its socket without disturb-

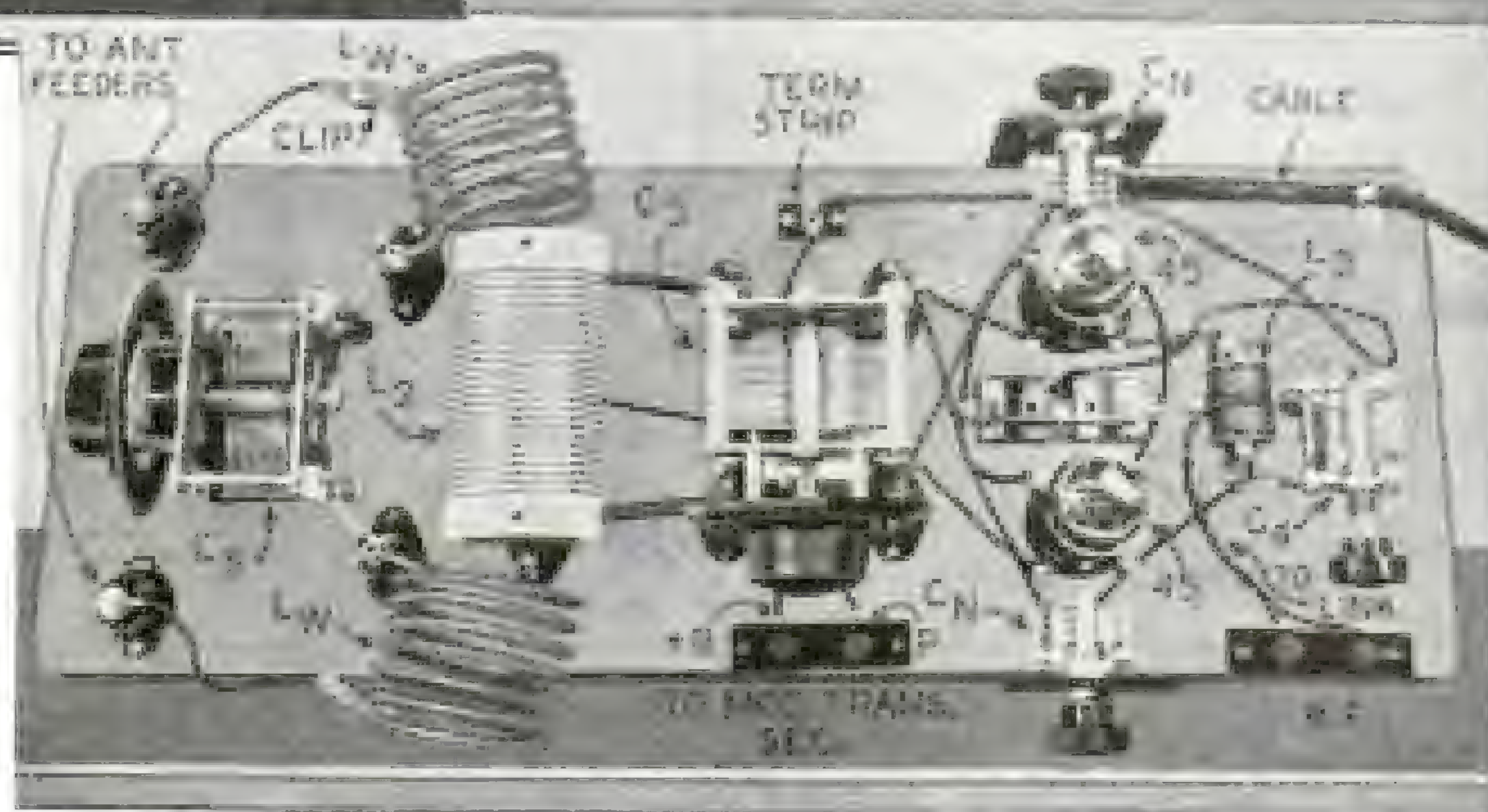


*Left, crystal oscillator, class-B modulator and speech amplifier; the R.F. amplifier unit is shown below*

By **CALVIN F. HADLOCK**

**B**EGINNERS in radiotelephone operation will find this bread-board layout easy to build, inexpensive and up to date in every detail. It is crystal controlled, employs Class B modulation, push-pull r.f. amplifier and has a built-in speech amplifier for a carbon microphone.

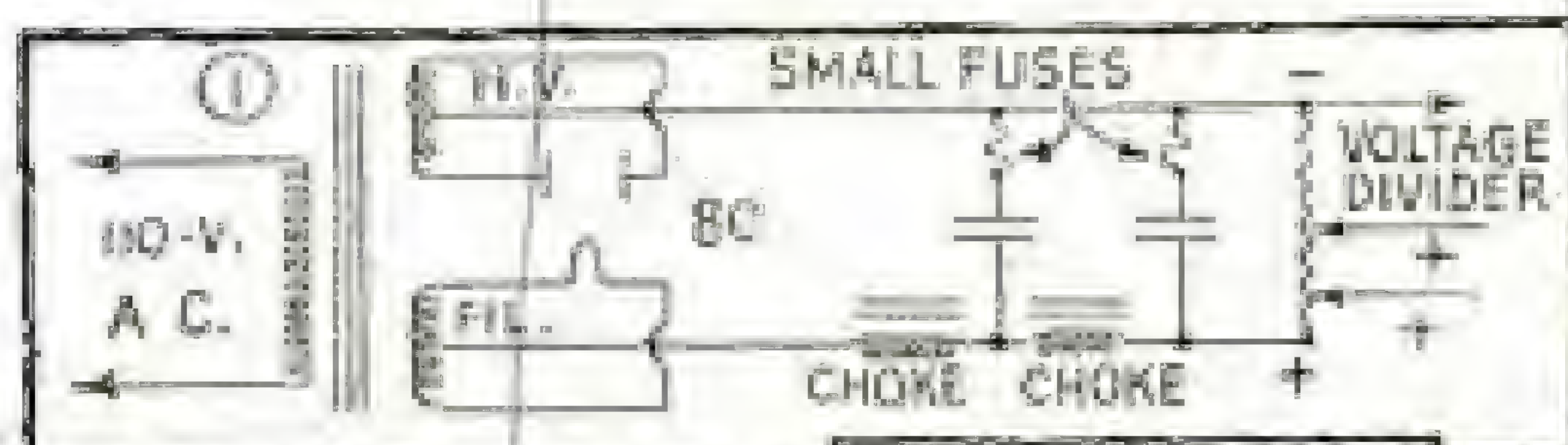
Since the 75 and 20-meter amateur radiotelephone bands are limited to those who hold a license for unlimited radiotelephone operation, the logical band for the inexperienced beginner is 160 meters. This phone band lies between 1,800 and 2,000 kilocycles. Consistent communication up to 100 or 200 miles and occasion-



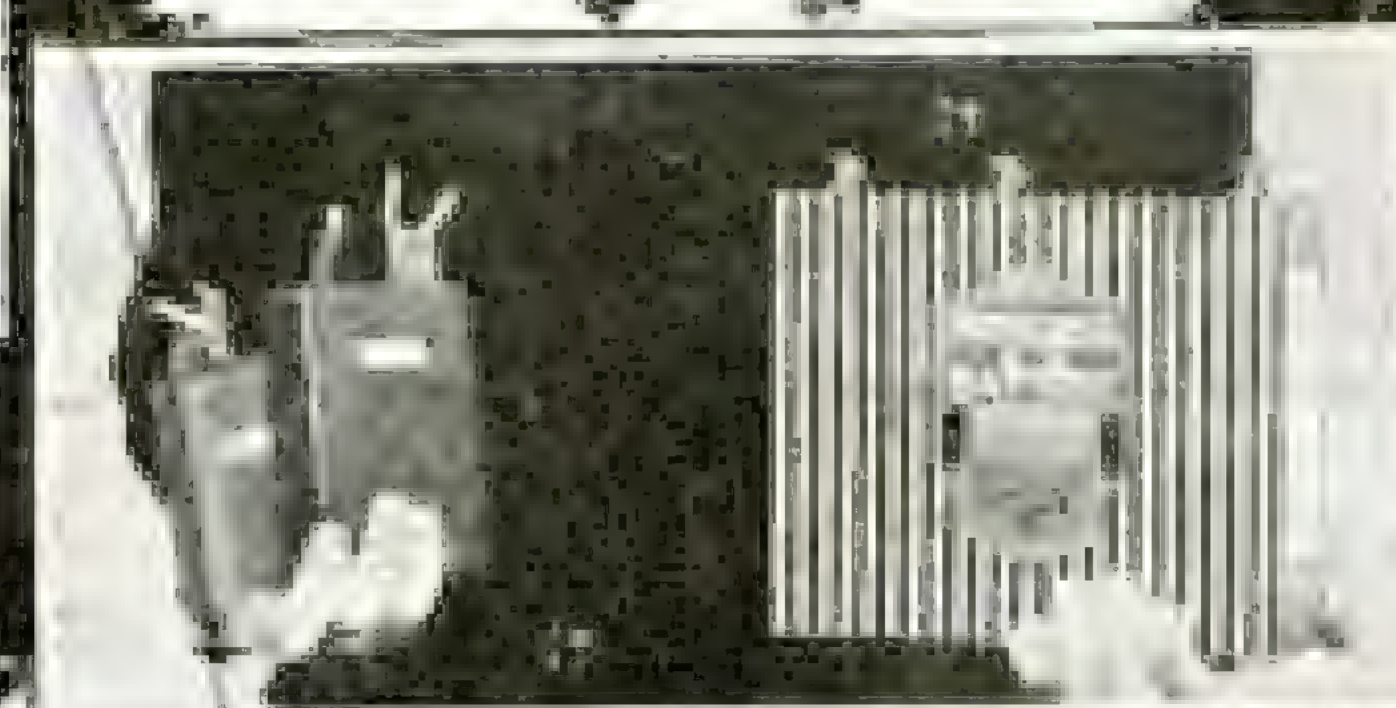
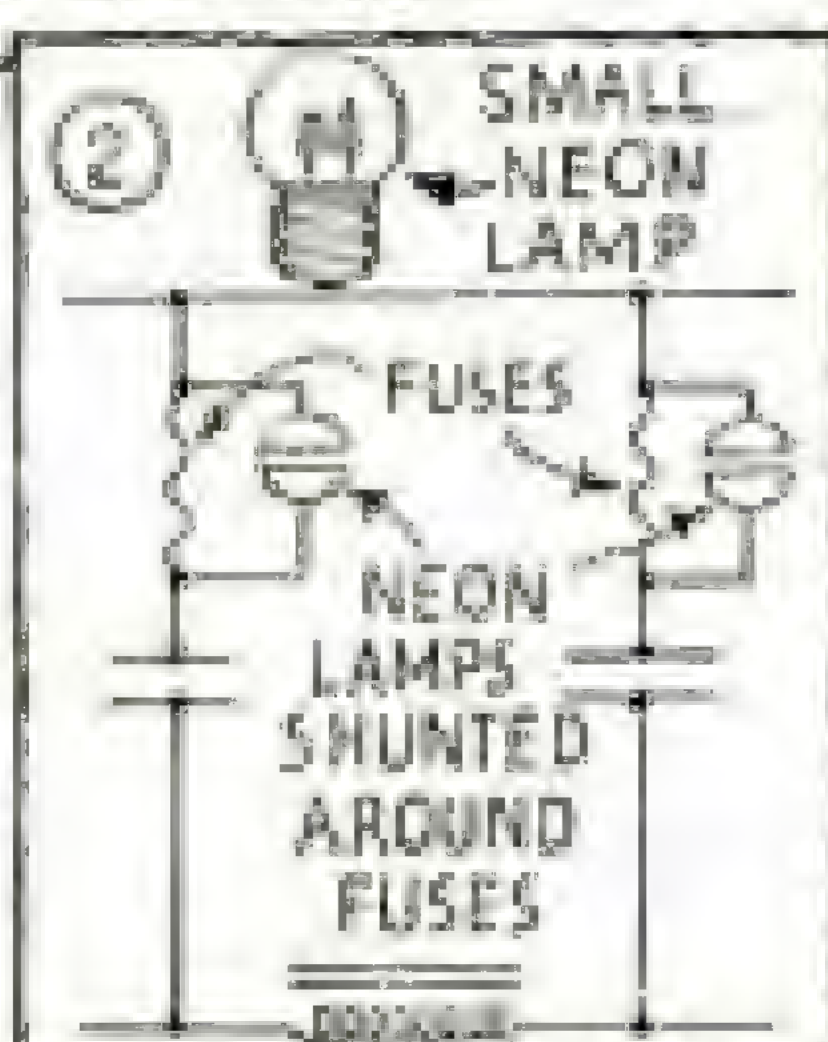


# PRACTICAL RADIO SUGGESTIONS

Right, section of old drain pipe fastened to base of antenna mast conceals counterweight which keeps antenna supporting rope taut



Neon lamps indicate filter condenser failure in power pack. Fig. 1 shows safety fuses; Fig. 2, lamps which light when condensers fail. Photo at right reveals size of new portable batteries compared with standard B-battery

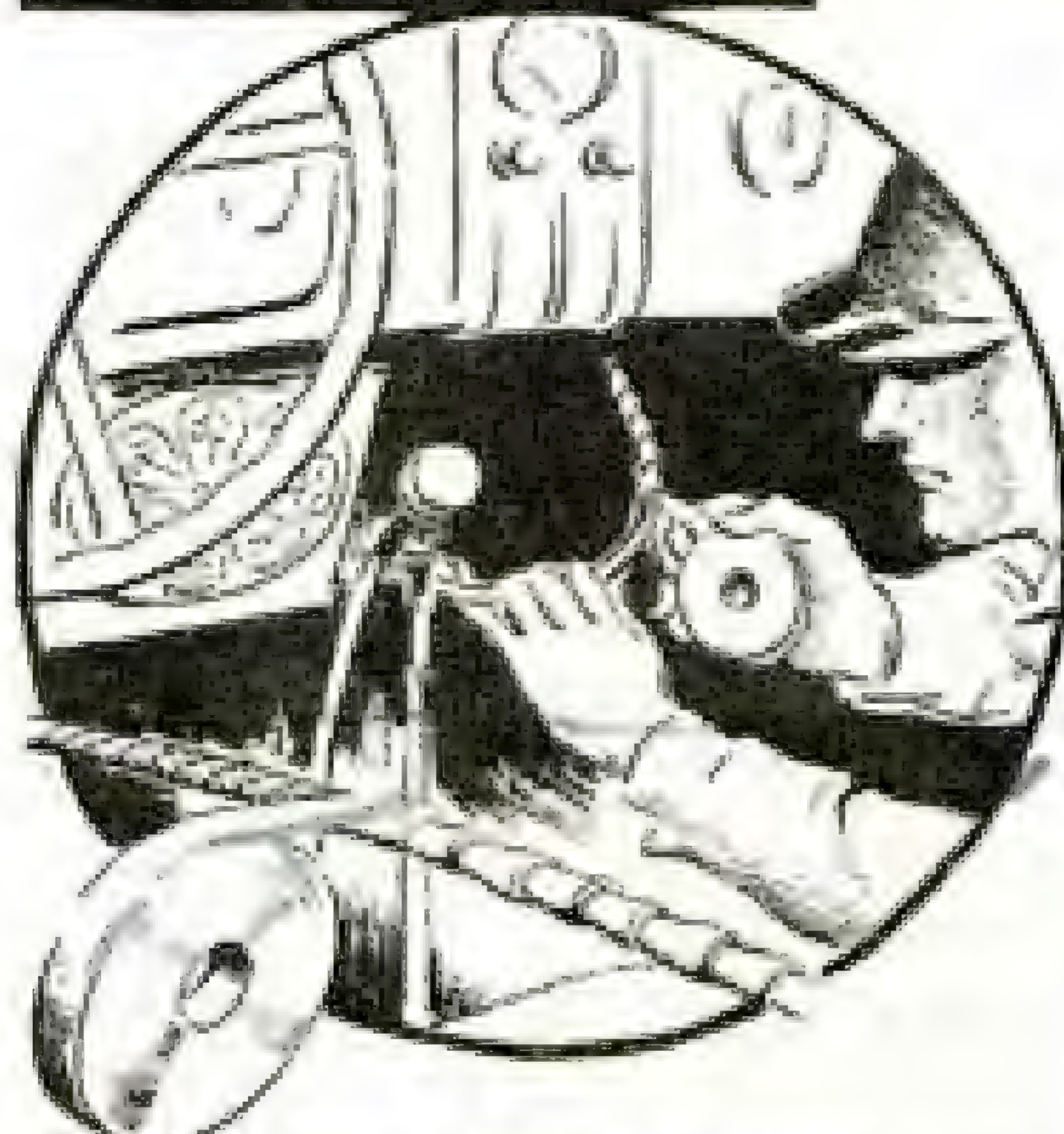


Above, Bakelite strip prevents shock from jack; brass ferrule on plug enters hole in cover strip. Left, Isolantite socket for metal tubes

83697

Right, collodion applied to first few turns and permitted to dry before coil winding is resumed helps hold turns in place. Left, flexible metal tape for shielding auto-lighting and ignition wires

83696

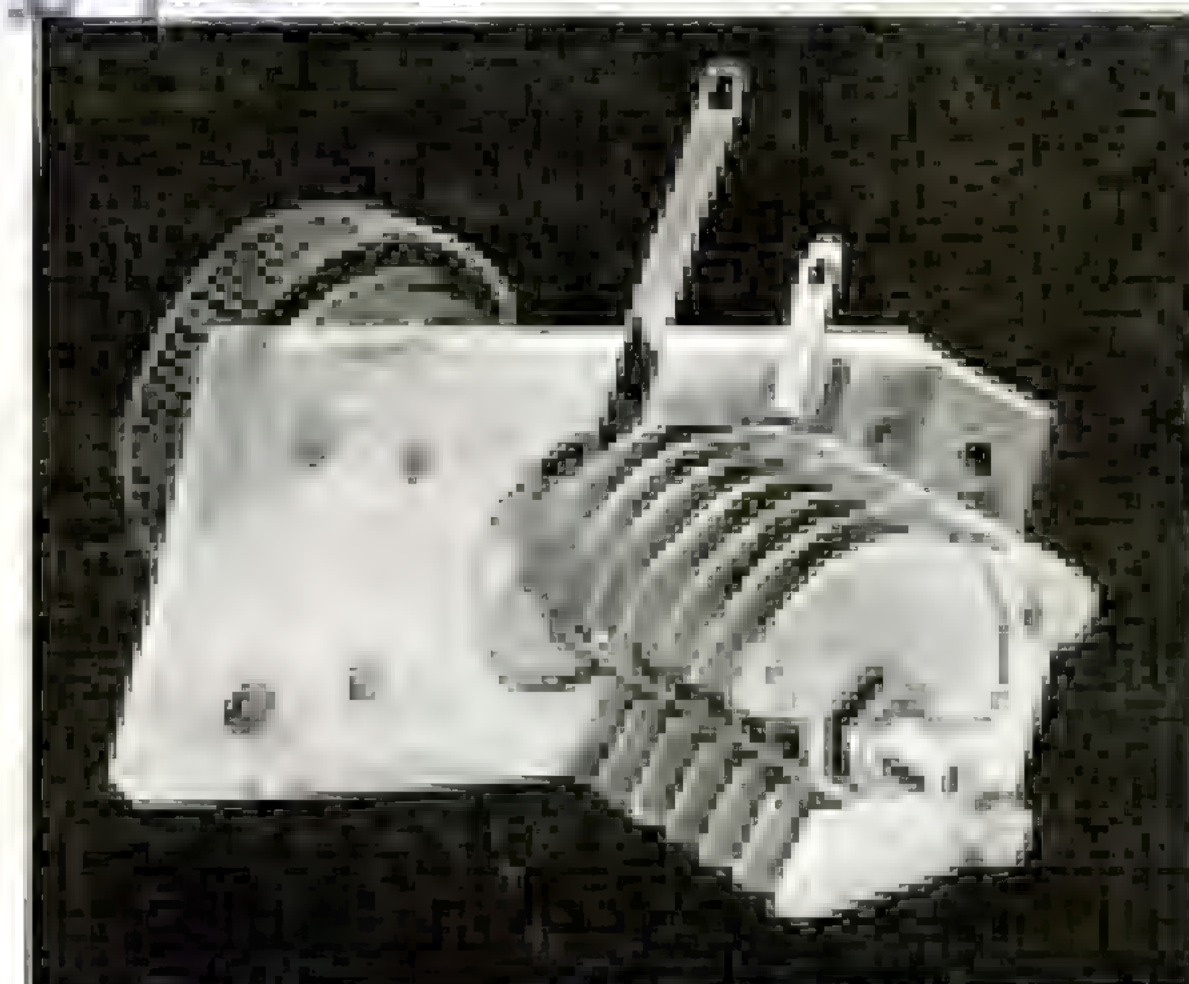


Below, interchangeable transformer and resistance-coupled plug-in audio stages for experimental short-wave receivers



Above, "ultra-midget" tuning condenser for ultra high-frequency receivers and transmitters designed to work in the bands below 10 meters

83693



COUNTER-WEIGHT SLIDES UP AND DOWN

SMALL TIN CANS OR SECTION OF PIPE MAY BE USED TO HOLD WEIGHTS

WOOD PLUG  
PIPE FILLED WITH SAND  
DRAIN PIPE

STRAP IRON

Burgess Battery Co. National Company  
Freeport, N.Y. 6150 Shepherd St.  
Boulder, Mass.

Consolidated Wire Corp. Teoma and Harrison Chicago

National Company  
670 Sherman Boulder, Mass



The Halliester Co.

3001 Southport Ave

# All-Wave Super Has Metal Tubes and Iron-Core I.F. Transformers

Chicago

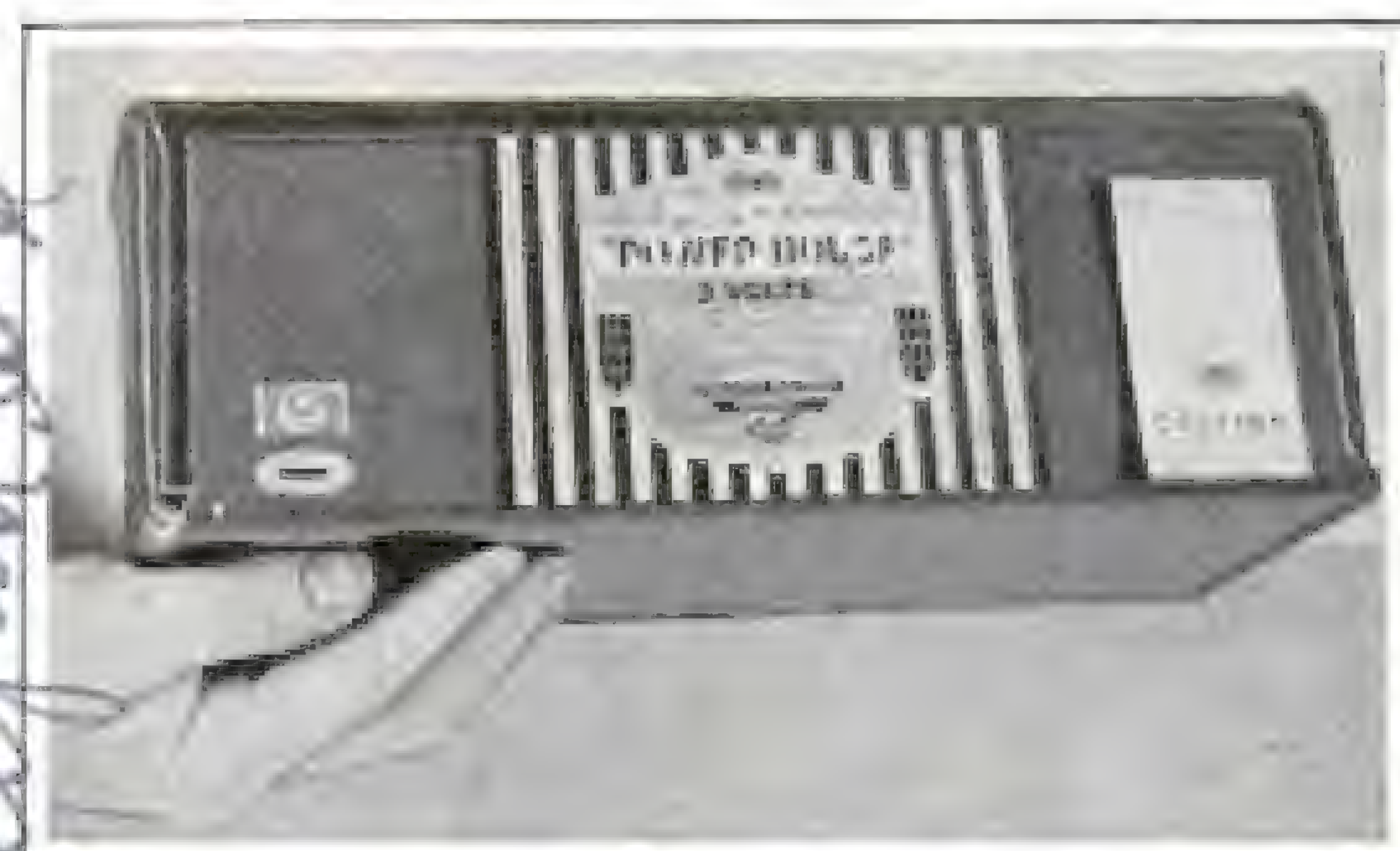


Five-band superheterodyne with vernier band-spread dial, built-in speaker and nine metal tubes

Nine metal tubes are used in this self-contained all-wave super which employs iron-core i.f. transformers to obtain high selectivity. It tunes from 7.4 to 550 meters, has crystal filter and other features of special interest to amateurs and short-wave listeners. Tested in Popular Mechanics radio laboratory, the results were highly satisfactory on all bands.

## A-Battery Unit Has Long Life

Designed for use with 2-volt battery-operated receivers, this compact 3-volt

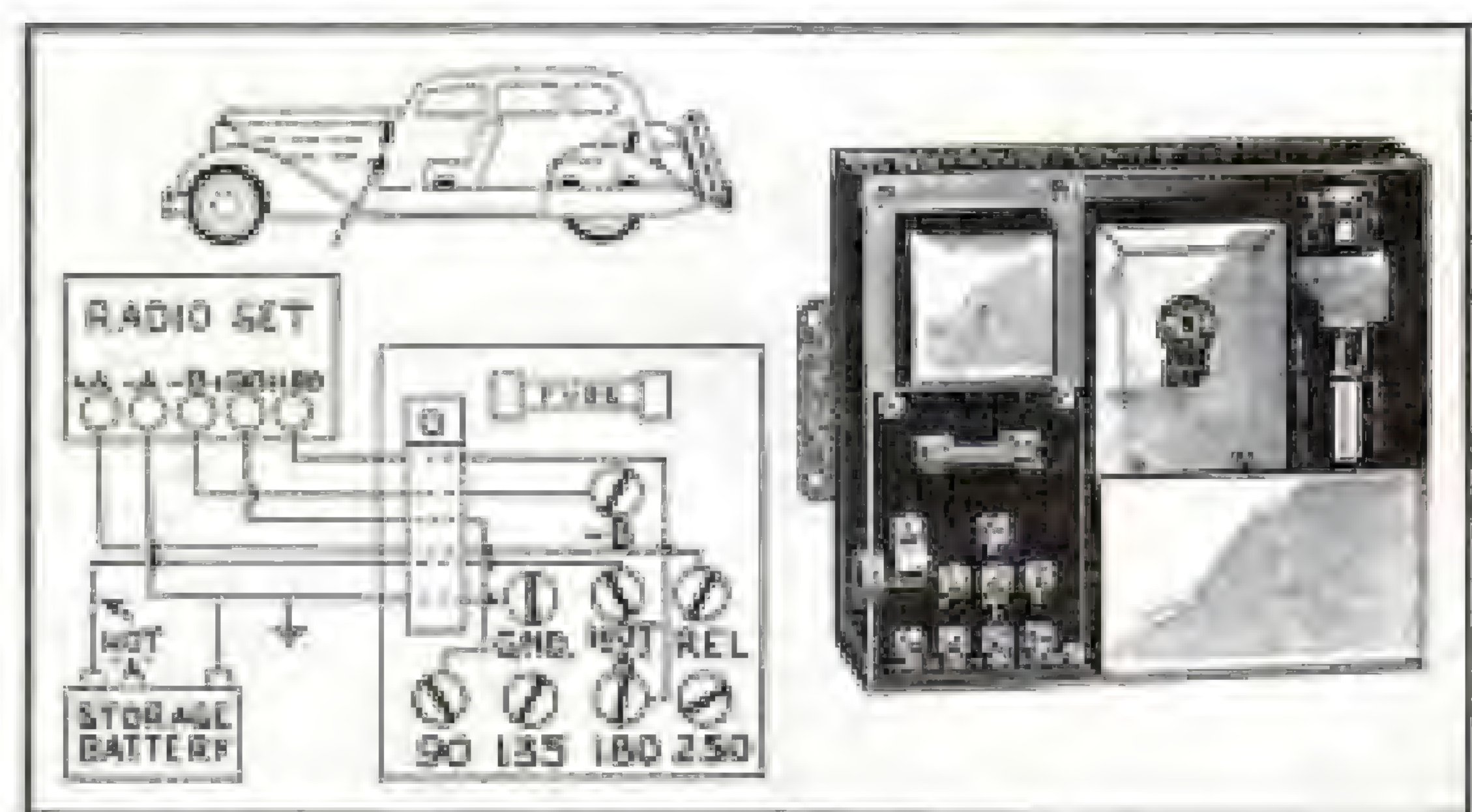


Heavy-duty dry A-battery for 2-volt sets

A-battery unit is claimed to deliver 400 hours service based on a 1/2-ampere discharge three to eight hours per day using an end point voltage of 1.8 volts per 3.0-volt battery. At this rate the operating cost is less than 1 cent per hour. It is necessary to use a resistor with the battery to step down the voltage to the required 2 volts. A suitable tapped resistor is available for receivers without a built-in voltage regulator.

## Tapped B-Power for Mobile Sets

The well-known principle employed for many years, of utilizing the direct current from a storage battery converted to pulsating current by a vibrating interrupter and obtaining high a.c. voltages through a transformer, has now been adapted to mobile radio by adding a rectifier tube and suitable filter. The device illustrated



B-power supply and suggested hook-up diagram

produces a smooth, quiet B-power supply for operating radio receivers in autos, motorboats and aircraft. It is claimed to be free from annoying hum and r.f. disturbances, the output being completely filtered, eliminating interference and feedback. The vibrator case is suspended between vibration-absorbing sponge rubber in a larger case for additional shielding.

Blueprints covering radio construction articles in past issues can be obtained for 25 cents each; material lists are available without charge on receipt of postage.

**NEXT MONTH—How to Build Your Own 2-Volt Portable Battery Receiver.** An exceptionally good 4-tube super for picnics, beach, country home or wherever power lines are not available. Other features include—A Dual Power Unit for Amateur Radiophones, also, an Electron-Ray Tuning Tube Adapter for Your Set.

General Transformer Co. S. Throp Chicago



B P 936



# The Latest in METAL FURNITURE

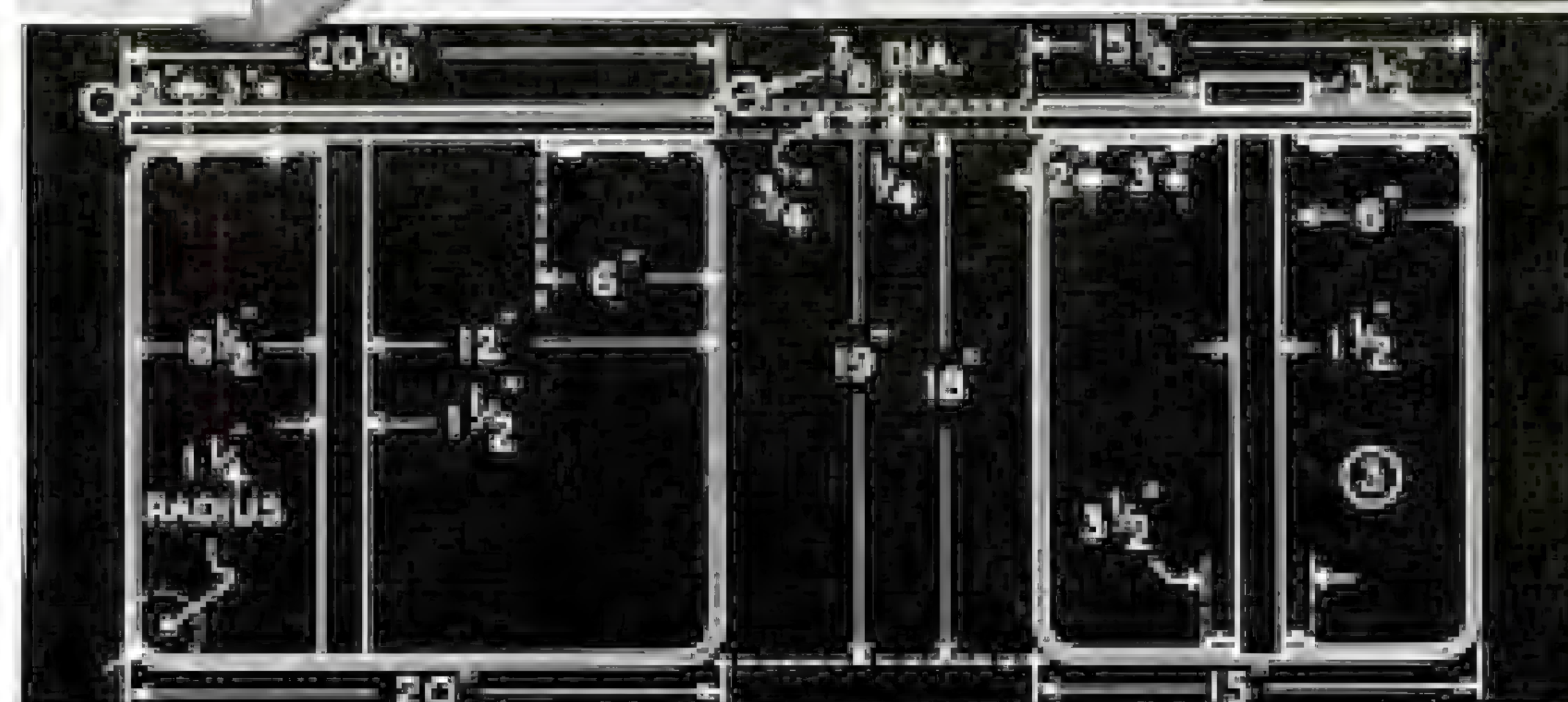
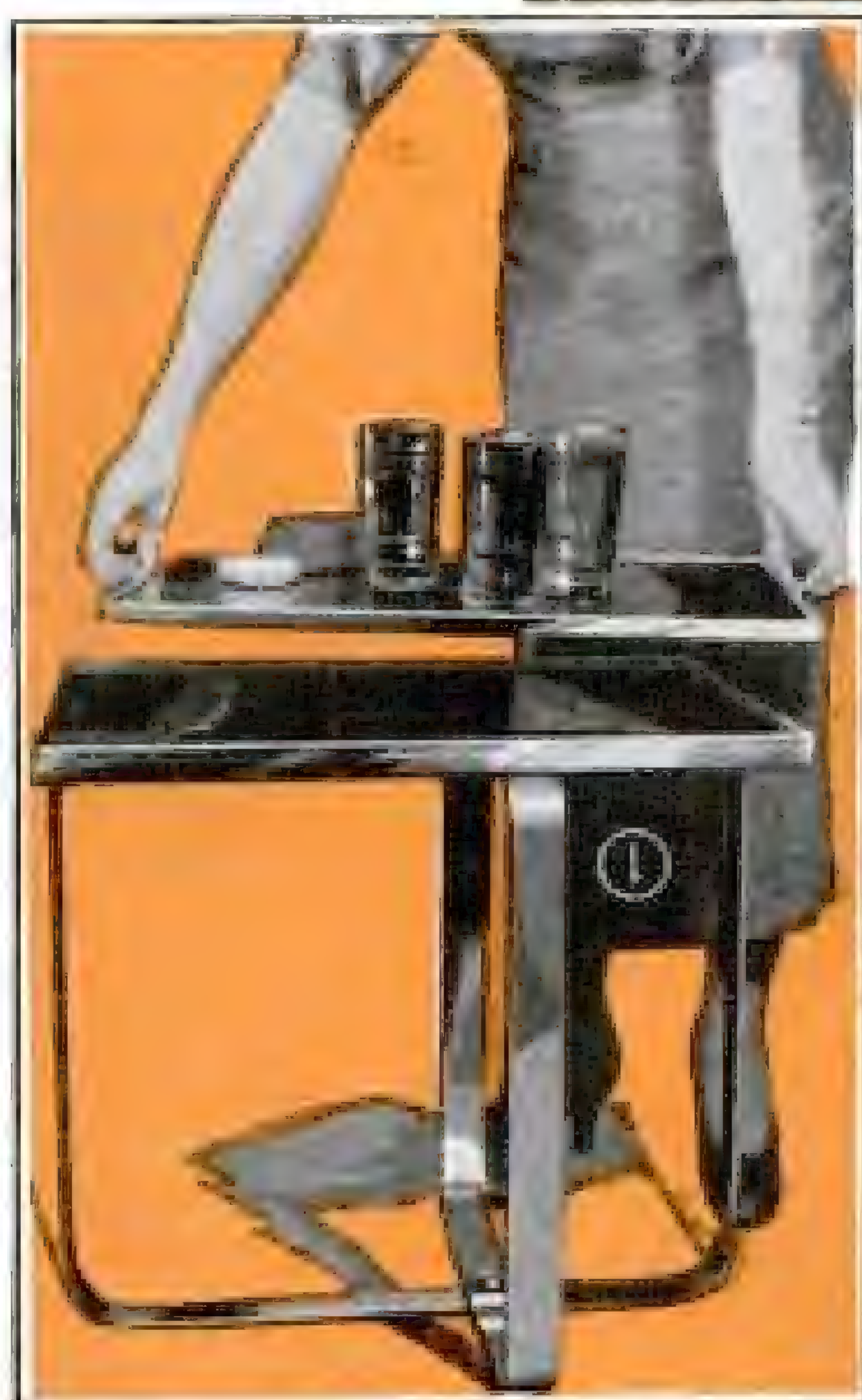
By Walter T. Warde

## PART IV—COFFEE TABLE AND TRAY of Simplified Design

**POLISHED** Bakelite or other suitable material of similar appearance and gleamingly bright aluminum, combine to make this modern coffee table, with its removable tray, Fig. 1, appealing to everybody. Besides being quite "at home" with other furniture that is not of the decided period type, it is in perfect harmony with the new classic style, and especially with the club type of furniture so popular at present. The approximate cost of the materials used is four dollars, and the simplicity of design makes it an easy piece to build.

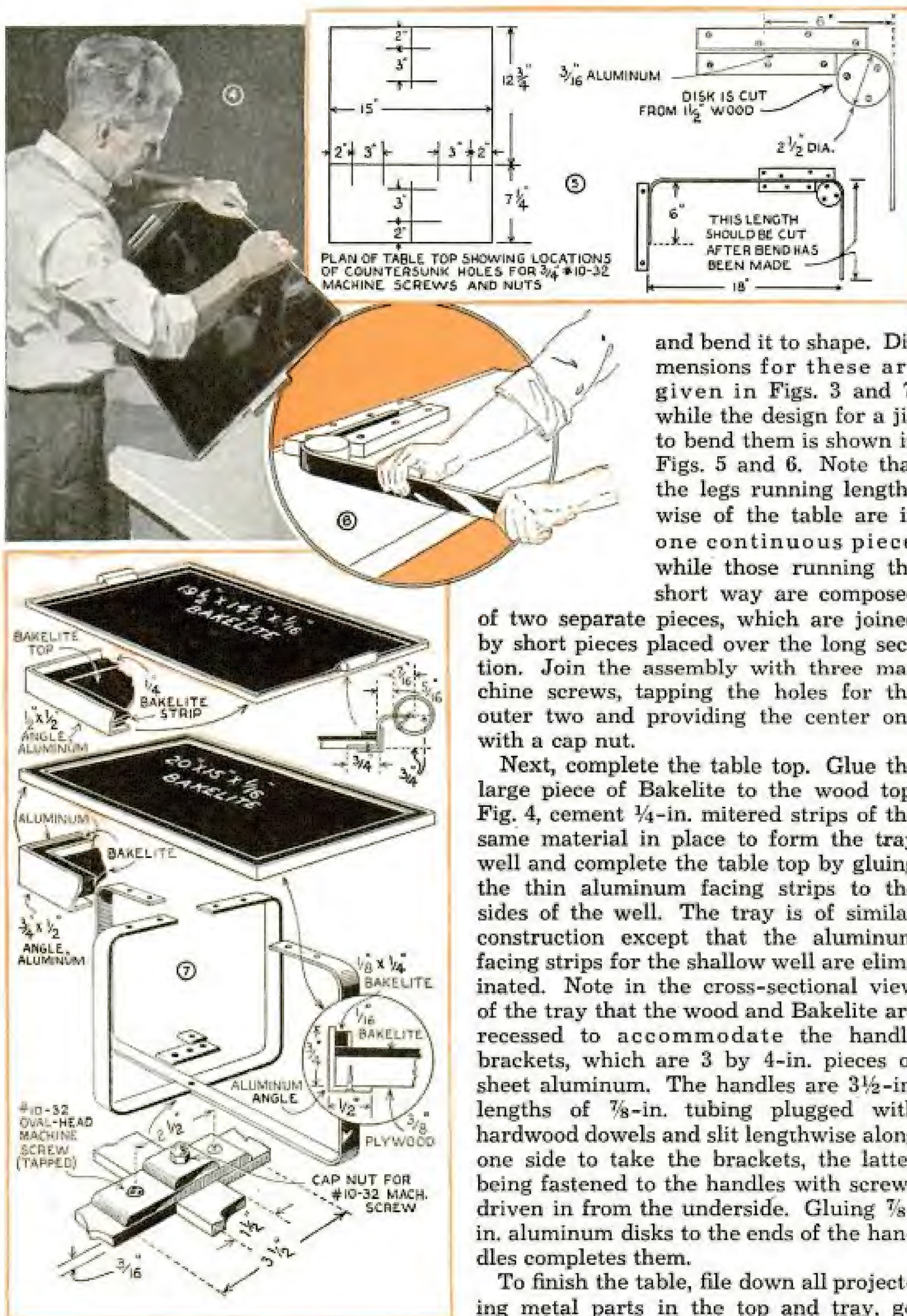
First, the wood and Bakelite for the table top and tray are cut to size and holes are drilled to hold the legs as indicated in the left-hand detail of Fig. 5. Next, cut  $\frac{3}{4}$  by  $\frac{1}{2}$ -in. angle aluminum and miter the ends so that the short side of the angle forms the support for the table top. Repeat this operation for the tray, using  $\frac{1}{2}$  by  $\frac{1}{2}$ -in. angle aluminum. Then fit the larger angle to the table top and screw it to the wood from the underside.

Next, cut the flat aluminum for the legs



Felt glued to the bottom of the tray will prevent any possibility of marring the polished Bakelite top





In bending the flat-aluminum legs, make your measurements carefully, using a 68-in. length for the long leg and two 31-in. lengths for the short ones

and bend it to shape. Dimensions for these are given in Figs. 3 and 7, while the design for a jig to bend them is shown in Figs. 5 and 6. Note that the legs running lengthwise of the table are in one continuous piece, while those running the short way are composed

of two separate pieces, which are joined by short pieces placed over the long section. Join the assembly with three machine screws, tapping the holes for the outer two and providing the center one with a cap nut.

Next, complete the table top. Glue the large piece of Bakelite to the wood top, Fig. 4, cement  $\frac{1}{4}$ -in. mitered strips of the same material in place to form the tray well and complete the table top by gluing the thin aluminum facing strips to the sides of the well. The tray is of similar construction except that the aluminum facing strips for the shallow well are eliminated. Note in the cross-sectional view of the tray that the wood and Bakelite are recessed to accommodate the handle brackets, which are 3 by 4-in. pieces of sheet aluminum. The handles are 3  $\frac{1}{2}$ -in. lengths of  $\frac{7}{8}$ -in. tubing plugged with hardwood dowels and slit lengthwise along one side to take the brackets, the latter being fastened to the handles with screws driven in from the underside. Gluing  $\frac{7}{8}$ -in. aluminum disks to the ends of the handles completes them.

To finish the table, file down all projecting metal parts in the top and tray, go over the entire assembly with fine steel wool and then buff the job. A buffing wheel on a flexible shaft, Fig. 2, is ideal.



## Tape Cutter Fits on Spool



Bent to a wide U-shape and sharpened on one edge, a narrow piece of spring steel makes a good cutter for adhesive tape. The cutter should fit tightly over the edges of the tape spool, yet loose enough so that it can be moved. In

use, the cutter is held with the fingers of one hand while the tape is pulled against the sharp edge with the other.

## Kitchen Utensils in Cabinet Hung on Sliding Arm

Sliding between two rabbeted strips, this bar for hanging saucepans and other kitchen utensils makes it easy to get them out of deep cupboards. You can use  $\frac{1}{2}$  by  $\frac{7}{8}$ -in. stock and the length is determined by the depth of the cupboard. Screw hooks are driven into the underside of the arm



*With this sliding arm on your cabinet you can reach utensils without getting down on your knees*

and a small handle, which may be a short wood screw or a small pot-lid handle, is provided at the outer end.

## Keyless Lock Foils Intruders Trying to Enter Door

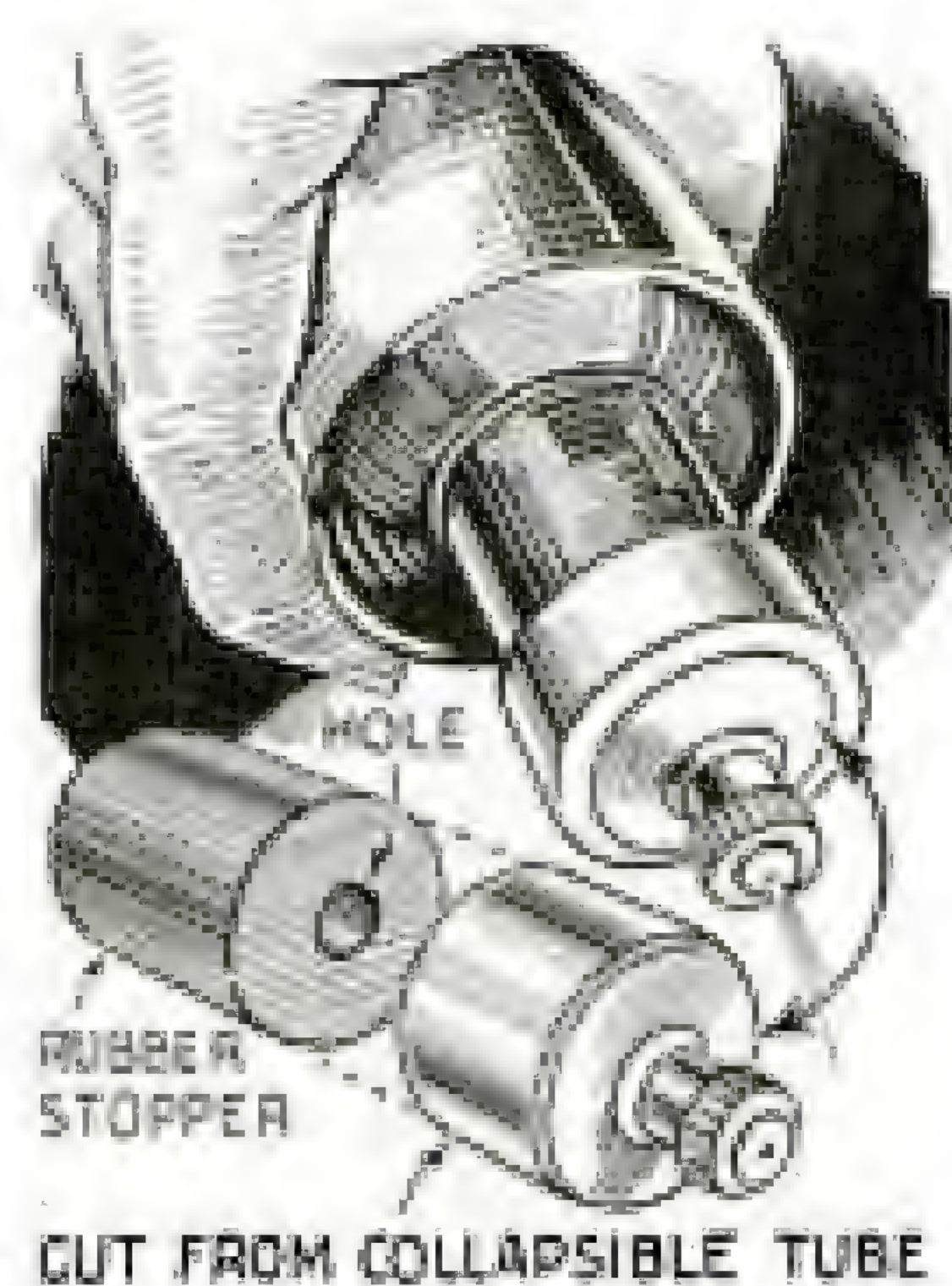


*Fit the dummy screw carefully so that it can be pulled out with the fingernails*

By simply pulling on a dummy screw located in the stile of this door, the lock or night latch is turned. The screw, which slips easily into a countersunk hole, is fastened to a cord. This in turn is wrapped several times around the shank of the lock handle so that the latter is turned when the cord is pulled.

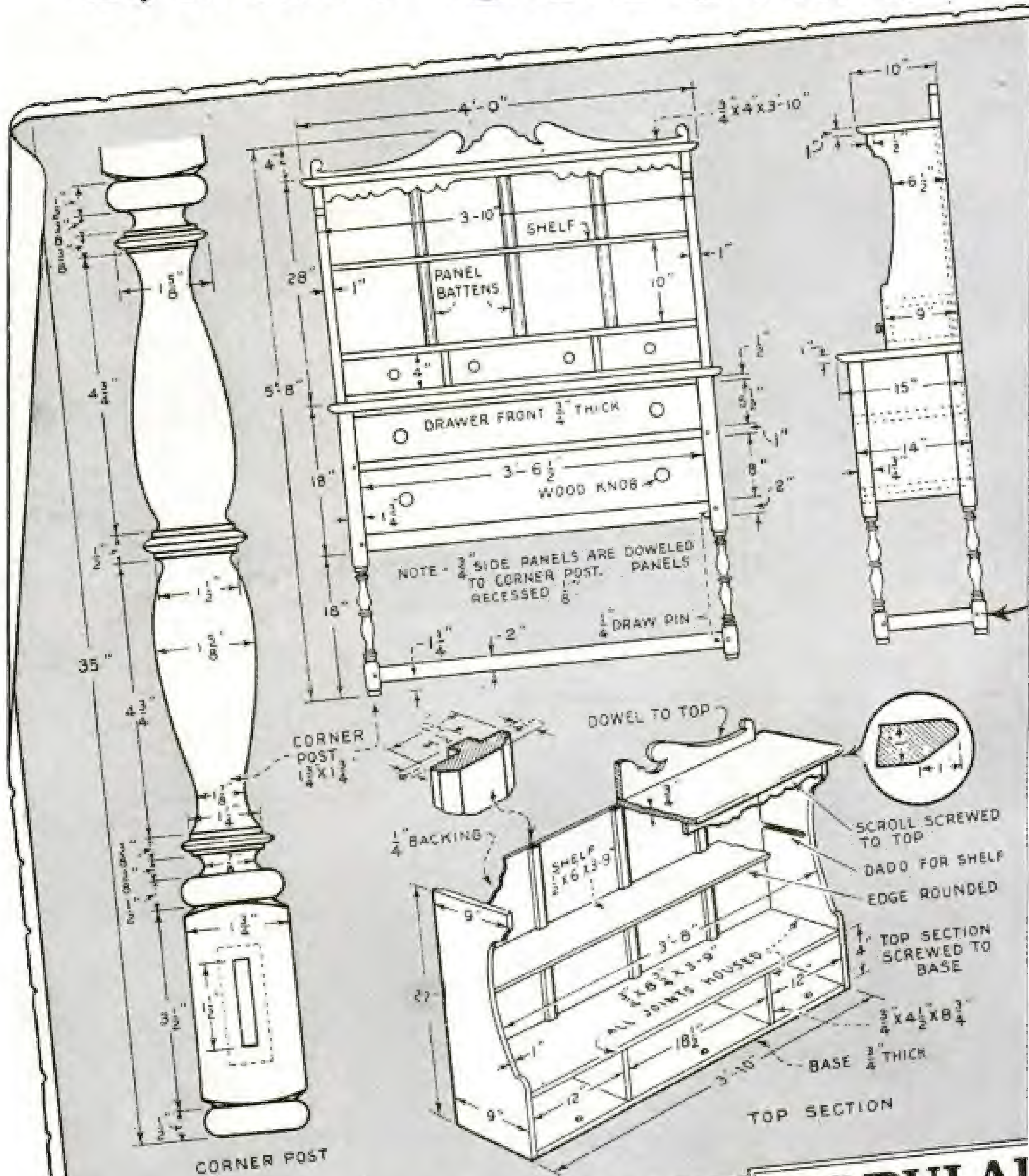
## Squirt Bottle Quickly Improvised

If you need a squirt bottle and none is at hand, one can be made quickly from a bottle and a collapsible tube. Cut off the top of the tube as shown and then drill a small hole lengthwise through the center of the bottle stopper, preferably a rubber one. Slip the end of the tube top snugly over the stopper and the job is done.





# QUAINT COLONIAL



A CAPE COD CUPBOARD

SCALE OF ASSEMBLY-1 1/4 IN. = 1 FT.

SCALE OF DETAILS  $\frac{3}{4}$  IN. = 1 IN.

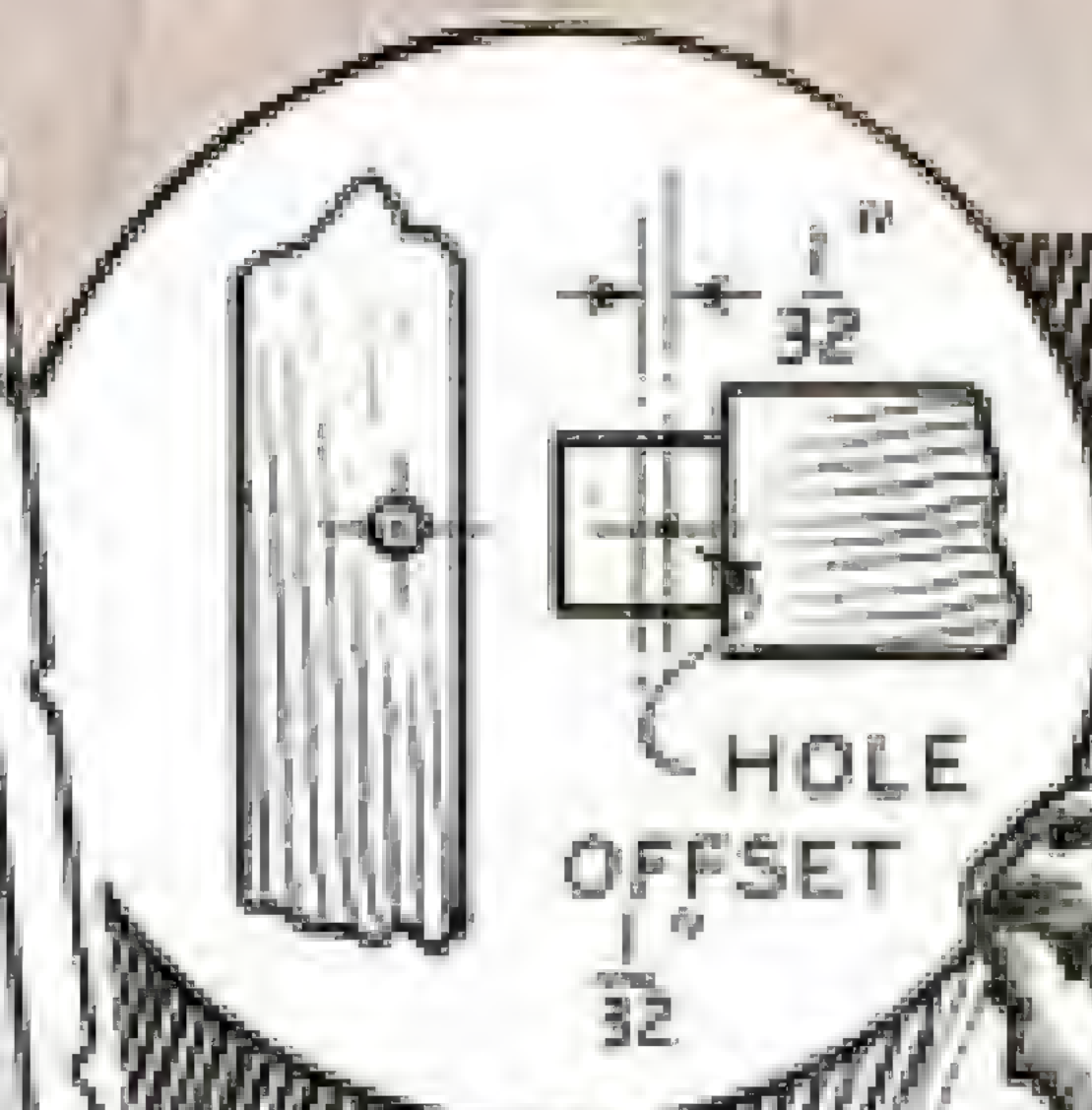
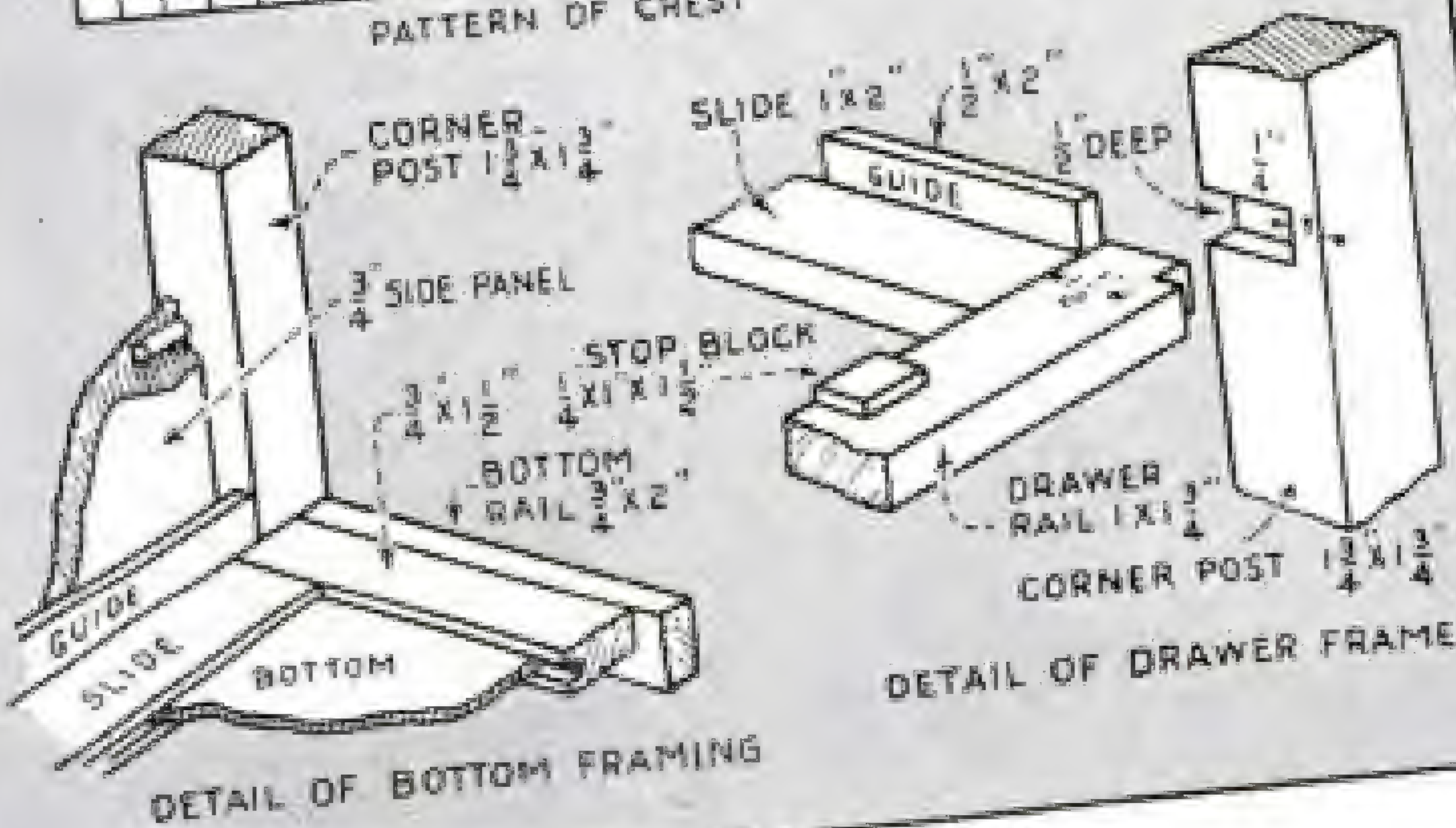
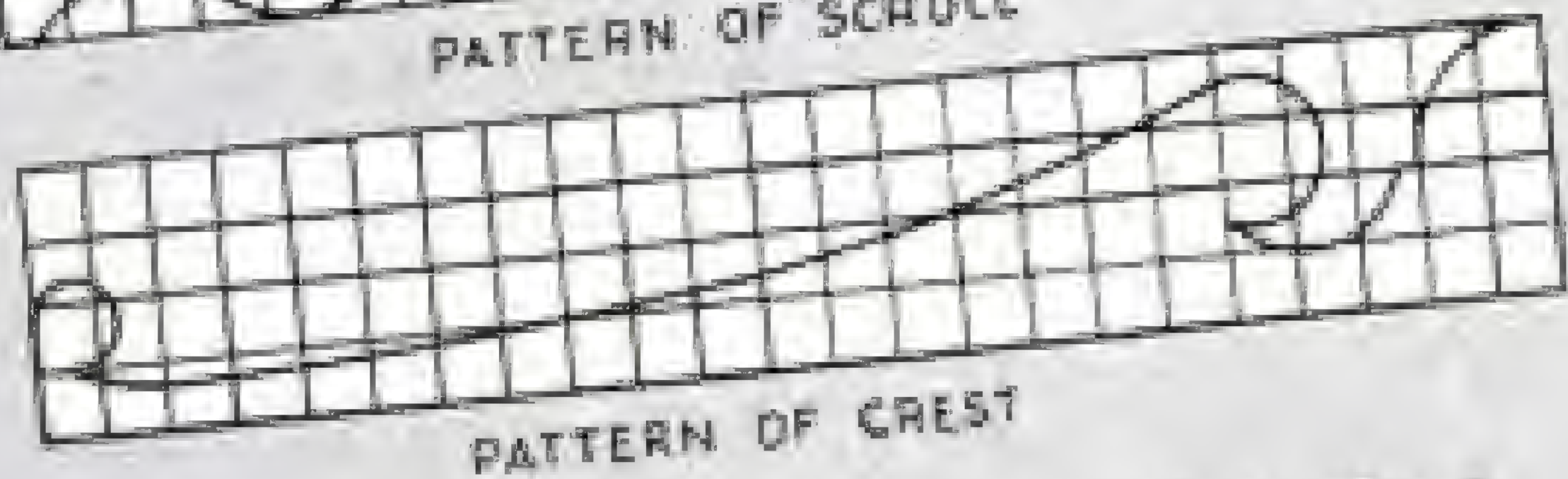
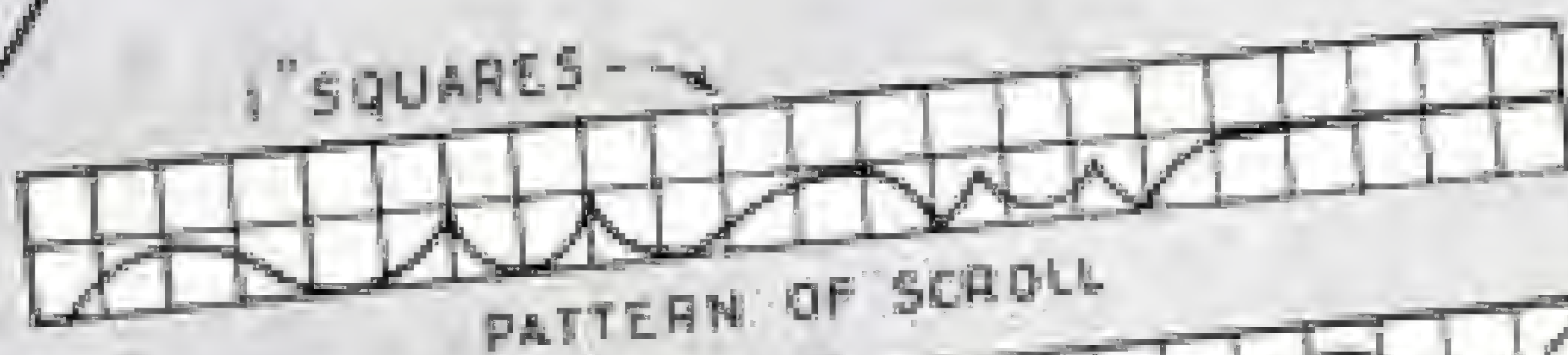
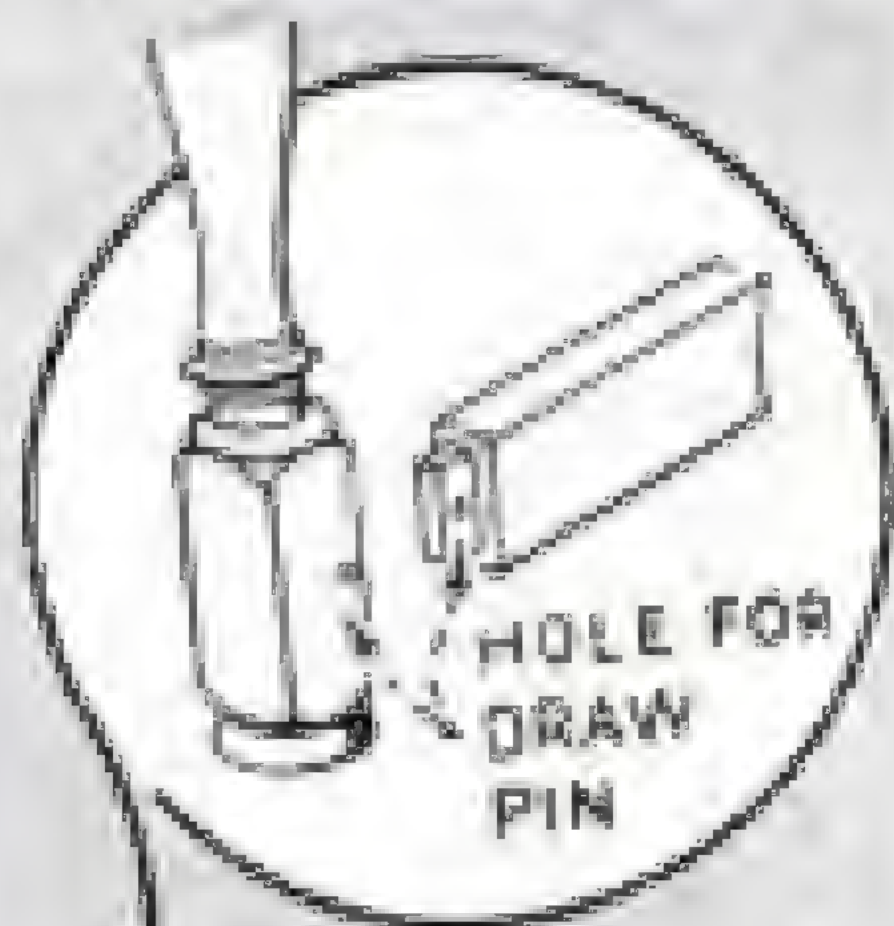
SPACED BY H. W. M.

TRACED BY  
CHECKED BY R.O.B

# POPULAR MECHANIC MAGAZINE



# CUPBOARD *in Knotty Pine*



SHEET NO. 1

ISSUE

MECHANICS MAGAZINE

Substantial in construction and pleasing in authentic colonial style, this quaint kitchen cupboard is small and compact, and provides ample space to store your linen and silverware. Knotty pine can be used, as this was the prevailing colonial custom, but other wood can be substituted if you desire. Any craftsman can build the entire piece, with the exception of the legs, by means of a few hand tools

923



## Hand Shield on Tinnert's Shears Made from Auto Tire



*Cut the shield from a tire having thin walls and it will not interfere with the shear action*

To protect the hands against sharp edges of the work when cutting large pieces of sheet metal with a pair of tinnert's shears, slip a piece of light auto tire over the shears as shown. Make a slot in the piece of tire to take the shears, cutting it large enough to allow free movement of the shear blades.

## Eraser Slipped over Pencil Point When Used Constantly

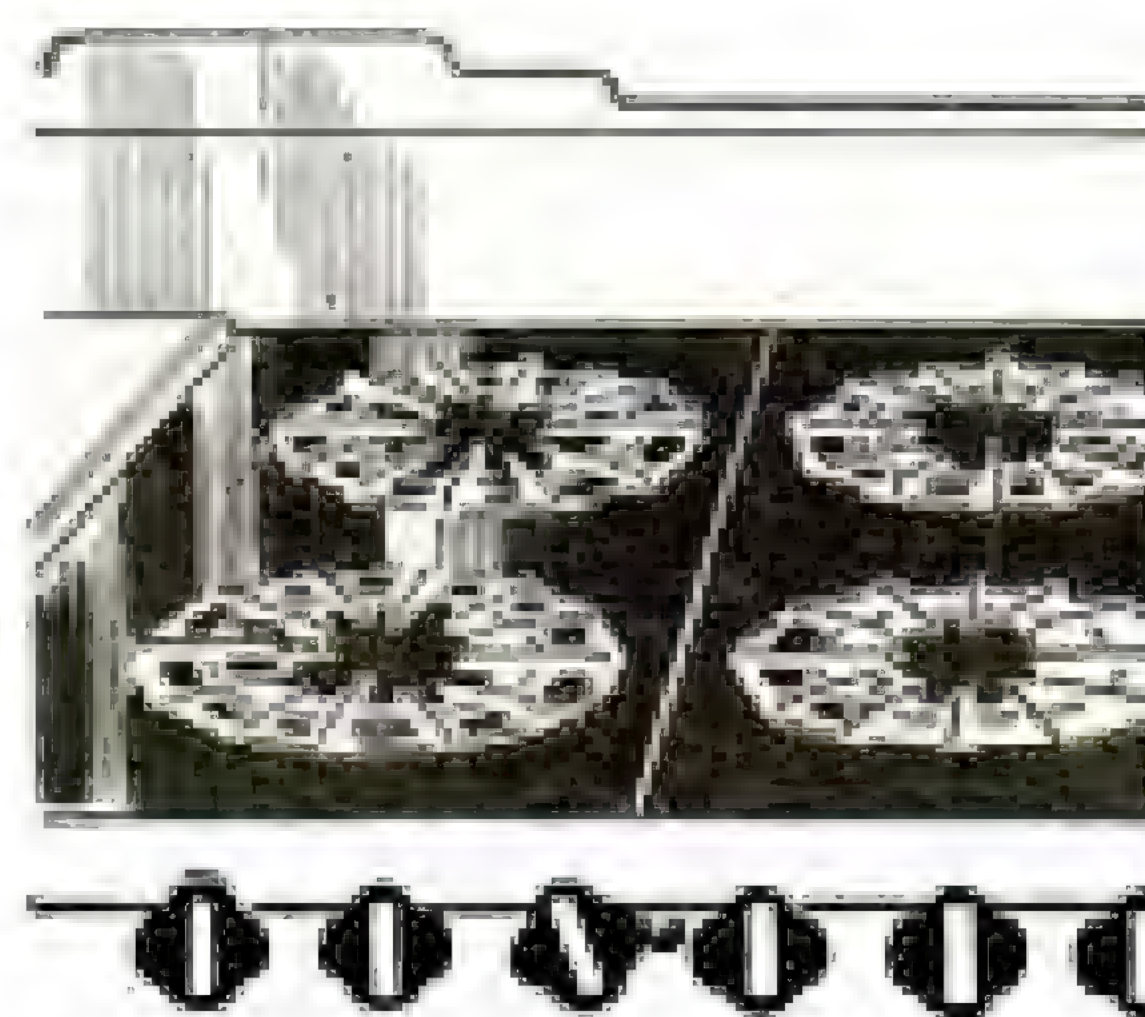


There are many cases where figures are read off hurriedly to clerks as for instance in election offices or where inventory is being taken, and every second counts. When mistakes in copying are made, there is hardly time to turn the pencil around, and, to avoid such waste of time, one clerk mounted an eraser on the lead end of his pencil, holding it in place with a spring-steel ring just tight enough to allow a slid-

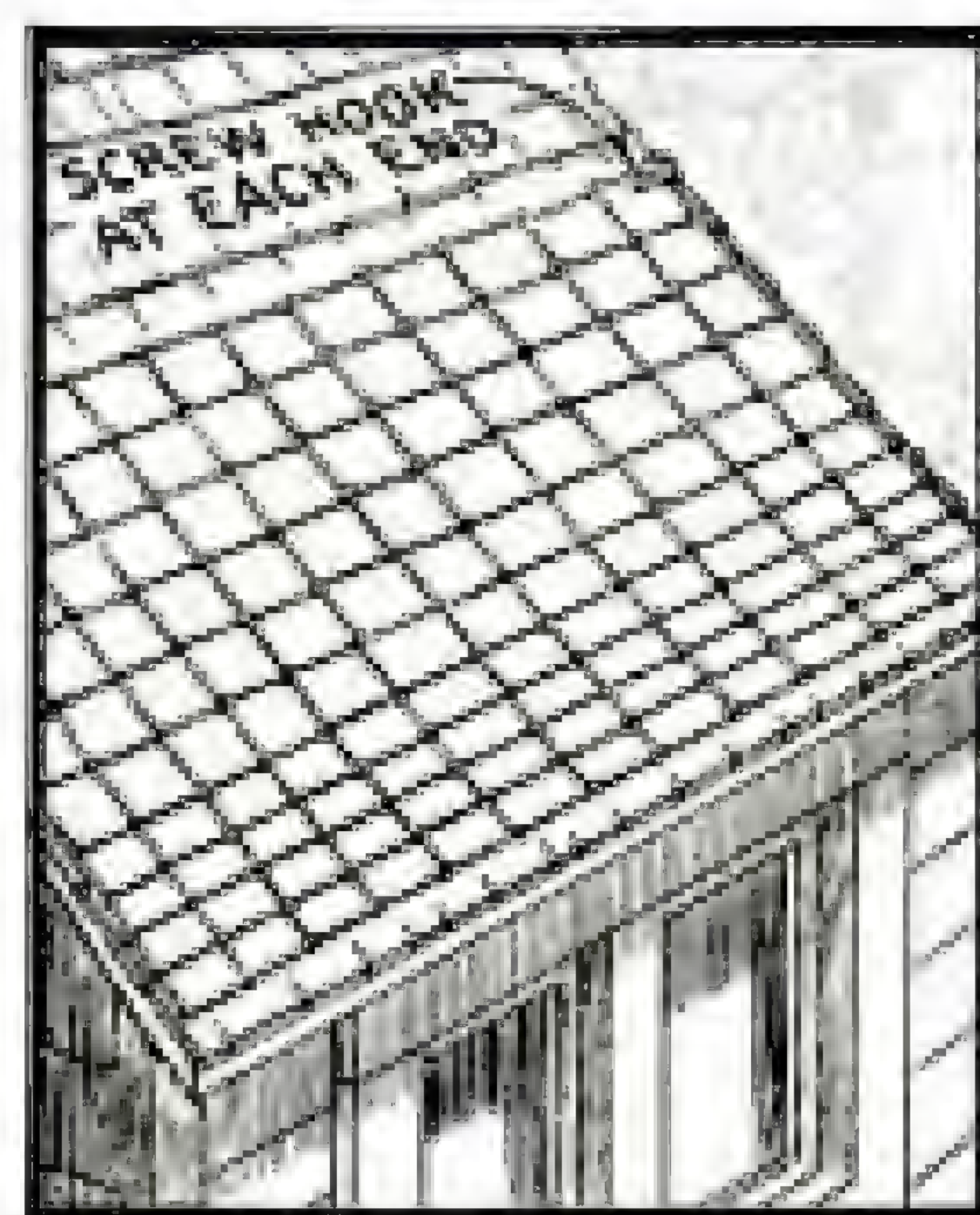
ing movement. Attached in this way, the eraser does not interfere with writing, yet when a mistake is made, the thumb deftly pushes the eraser out for use, and just as quickly pushes it back again.

## Lines on Stove-Cock Handles Show When Gas Is Off

White lines painted vertically on round handles of gas-stove cocks will enable you to tell at a glance whether they are open or closed. Or, you can use narrow strips of adhesive tape instead of paint. When applying the paint or tape, be sure the cocks are shut off tightly.



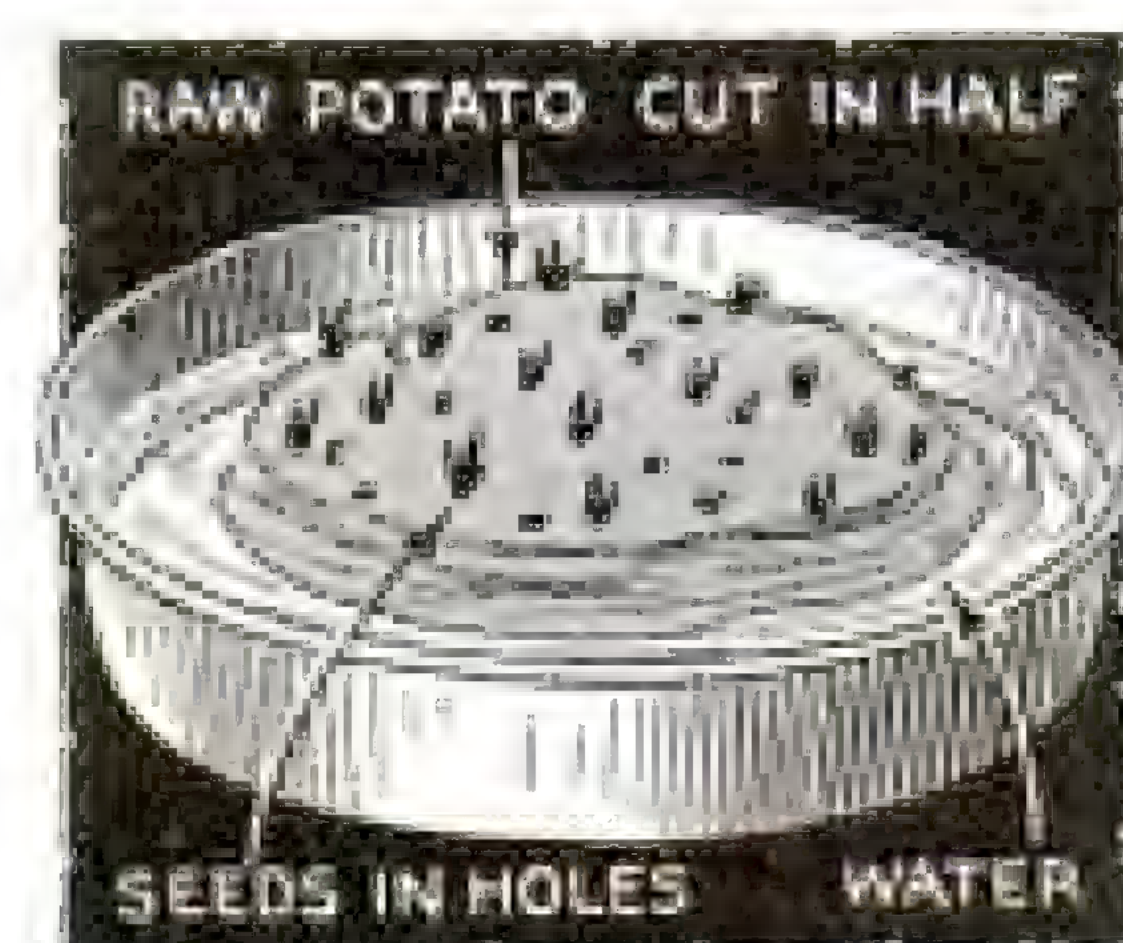
## Wire Prevents Snow Slides from Steep Roofs



Where a high dormer or porch with a steep roof overhangs a sidewalk, there is a possibility that melting snow may fall and injure someone. An occurrence of this kind led one home owner to stretch poultry wire across the lower portion of the roof, as shown, to hold the snow. The wire is fastened to the edge of the roof with screw hooks.

## Testing Seeds in Raw Potatoes

For making a germination test of a small number of seeds punch holes in one half of a raw potato and insert one seed in each hole. Then place the potato in a shallow pan partly filled with water and set it in a moderately warm place until the seeds sprout.





## Protecting Contents of Crowded Refrigerator



*A guard rail, which can be lowered, will keep dishes and bottles from slipping off the shelves, while a pan with separators will protect your eggs and permit utilizing space above the pan*

If your refrigerator shelves are so crowded that dishes near the edge occasionally slip off or are inadvertently knocked off when removing some larger items from the back, a simple wire guard rail, which may be swung out of the way when necessary, will save both dishes and food. The rail is bent from heavy wire as shown in the circular detail, and is pivoted to the edge of the shelf by means of eyes formed in the ends of the wire. Pieces of

sheet metal folded around the ends of the wire and fitted with hooks hold the rail vertically. Another idea is to store your eggs in a flat pan, using egg-carton separators, which beats the usual practice of keeping eggs heaped in a pan or bowl. Besides providing a safer place to keep the eggs, the use of a pan gives more orderly arrangement and often makes it possible to utilize the space above the pan if a cover is provided to support other objects.

## Floral Carvings Are Imitated with Seeds and Pine Cones

If you are an admirer of floral carvings but are not adept at this work, you can make good imitations in the form of over-



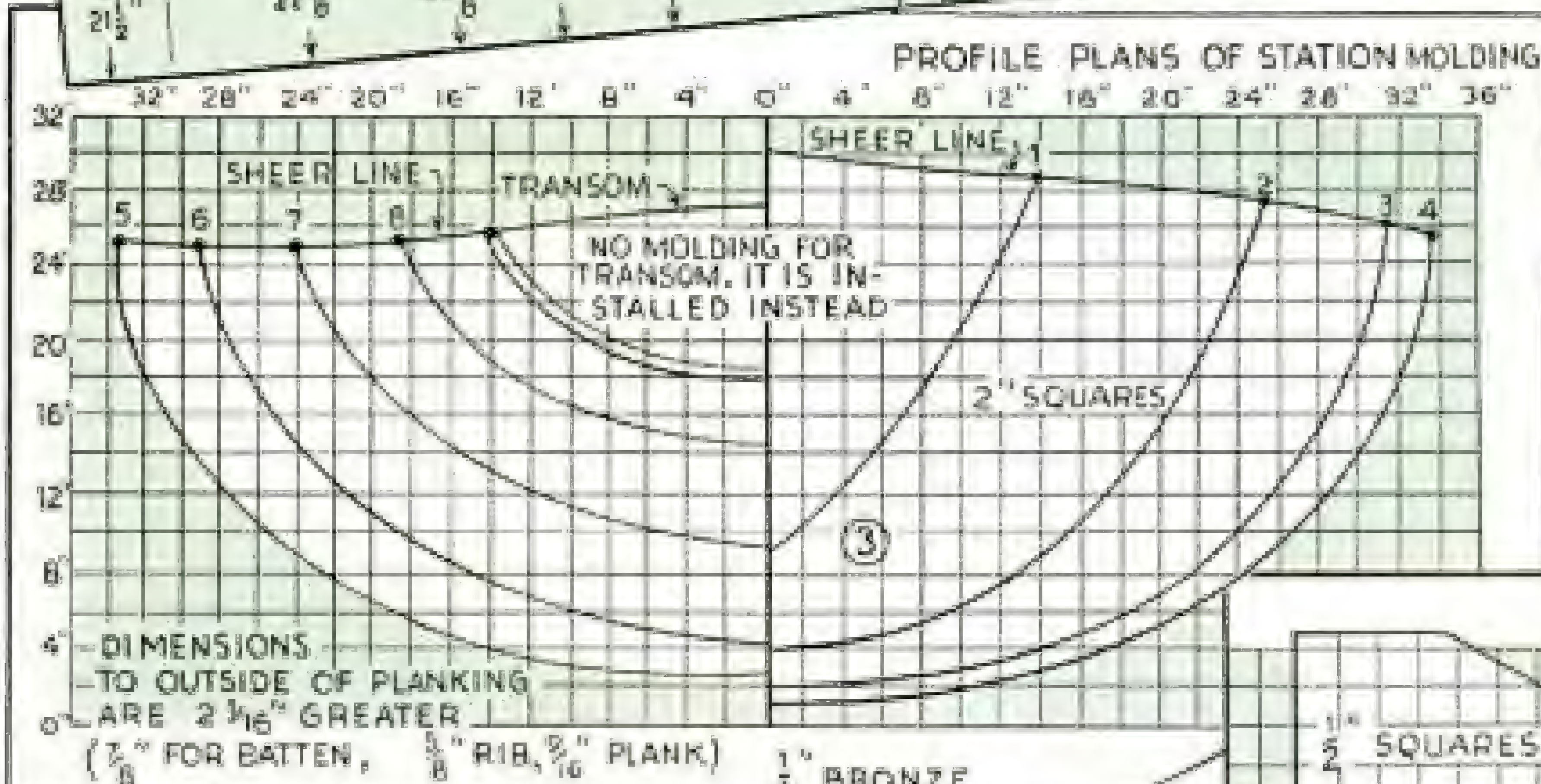
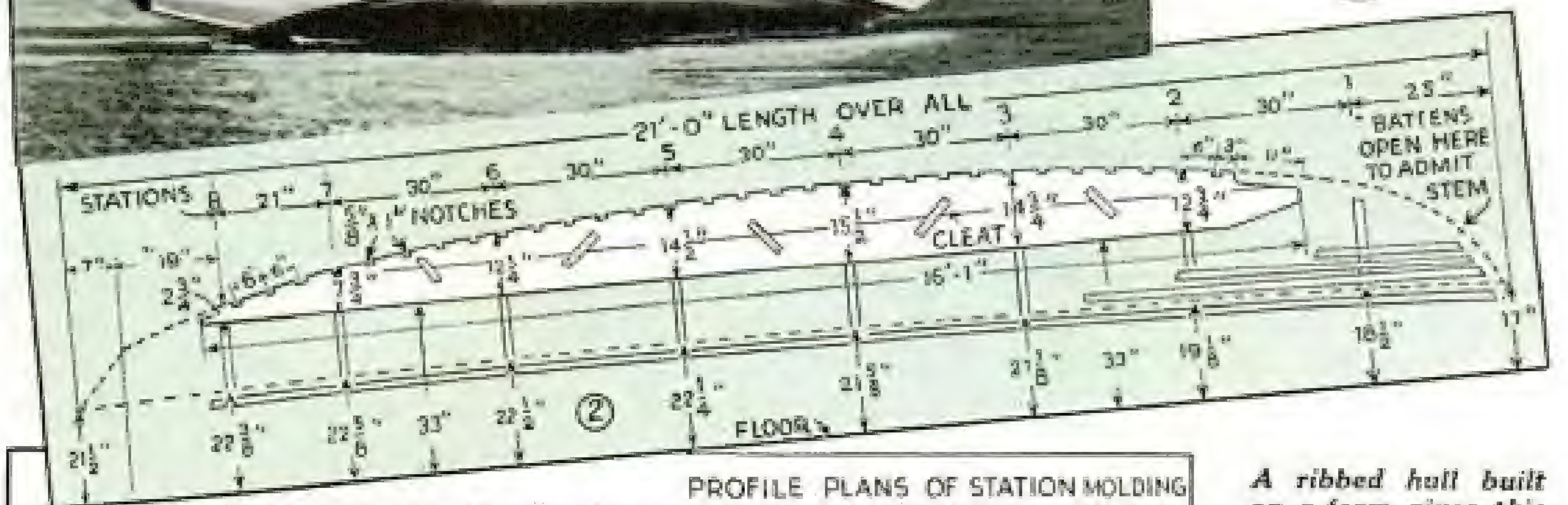
*Cone scales simulate the flower petals while the stamens and pistils are formed with the seeds*

lays by simply building up the designs with hard seeds of plants and the scales of pine cones. For deep designs, use large cones similar to those of western yellow pine. Cones of white-pine trees have thinner scales, which are best for shallow designs, while those of spruce, fir, hemlock and larches are used for small decorations. First trace the design to be copied on the work, and then fill in the pattern, using the scales to simulate petals of flowers and the seeds for the stamens and pistils, attaching each one with a drop of glue. As soon as the glue has dried, apply two coats of shellac or clear varnish. If you prefer bright colors, paint the scales and seeds before applying them.

¶Vegetables that grow underground will cook better when covered; those that grow above the ground cook best uncovered.

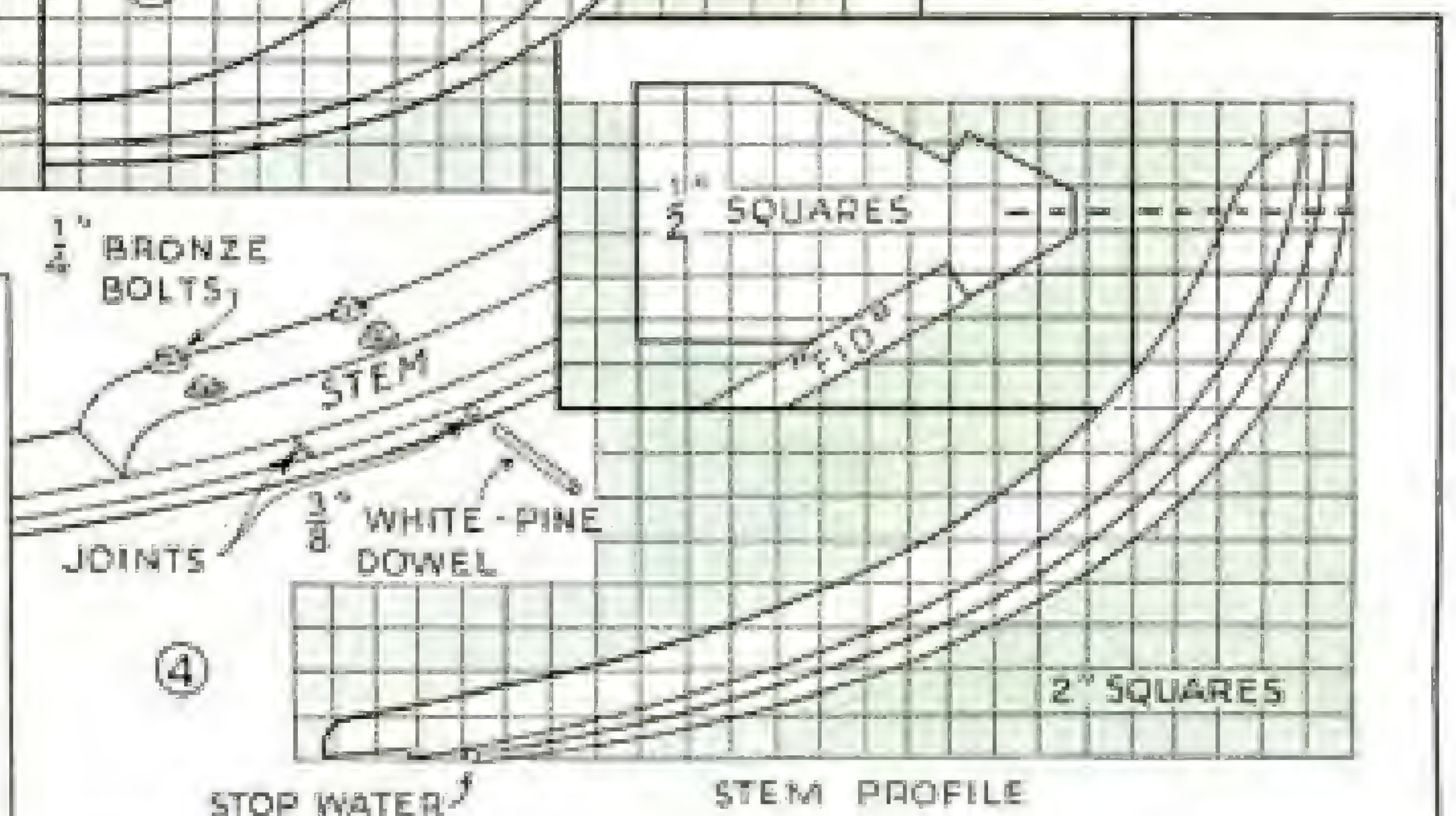


# "ARROWHEAD"



A ribbed hull built on a form gives this sloop its trim, racy lines. Begin work as in Fig. 1, by laying out full-size profiles on long strips of heavy paper. Fig. 2 shows the backbone of 2 by 8-in. pine and how it is braced to the floor

The station molds give the hull its smooth, graceful contours, and the profile plans in Fig. 3 enable you quickly to lay out the curves full size. Spruce battens over the molds form the foundation for the ribs. Once the form is built, you're ready to get out the stem, a profile of which is shown in Fig. 4





# SLOOP - *Fast Trim and Able!*

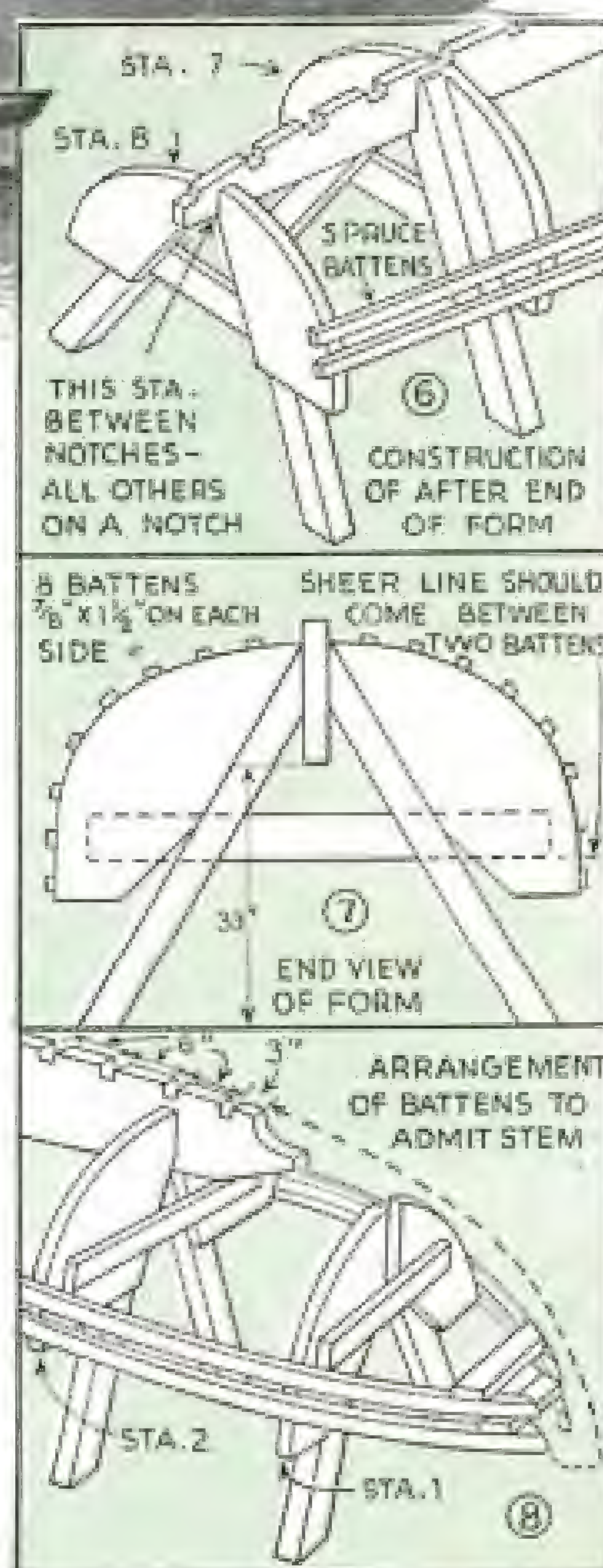


*Designed and built by Charles H. McAlary of Newport Beach, Calif., this sloop recently won a cup in a free-for-all race on Lake Arrowhead in the same state. With an over-all length of 21 ft. and a beam of 5 ft. 11 in., this speedy little craft is especially designed for quick maneuvering in difficult waters*

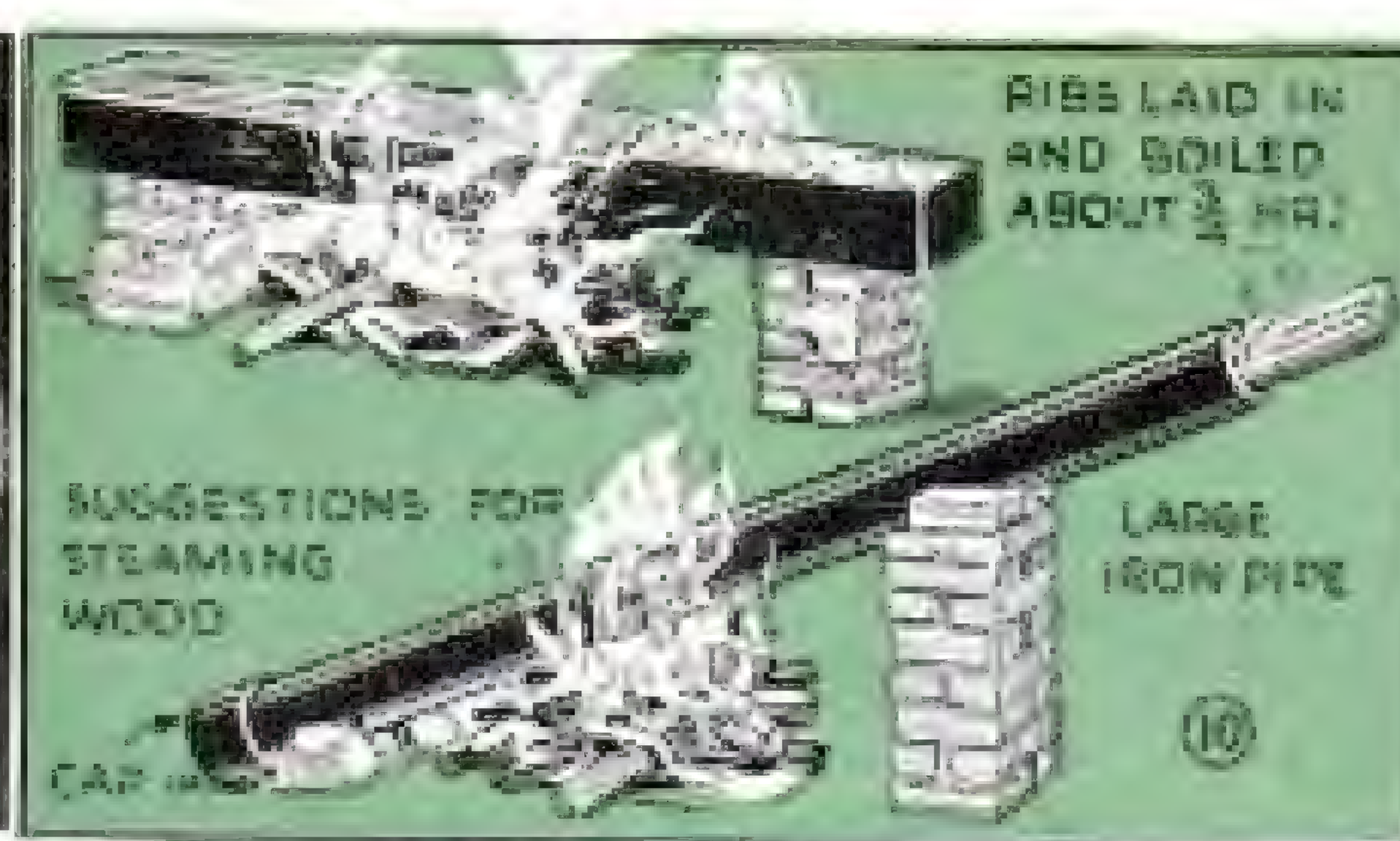
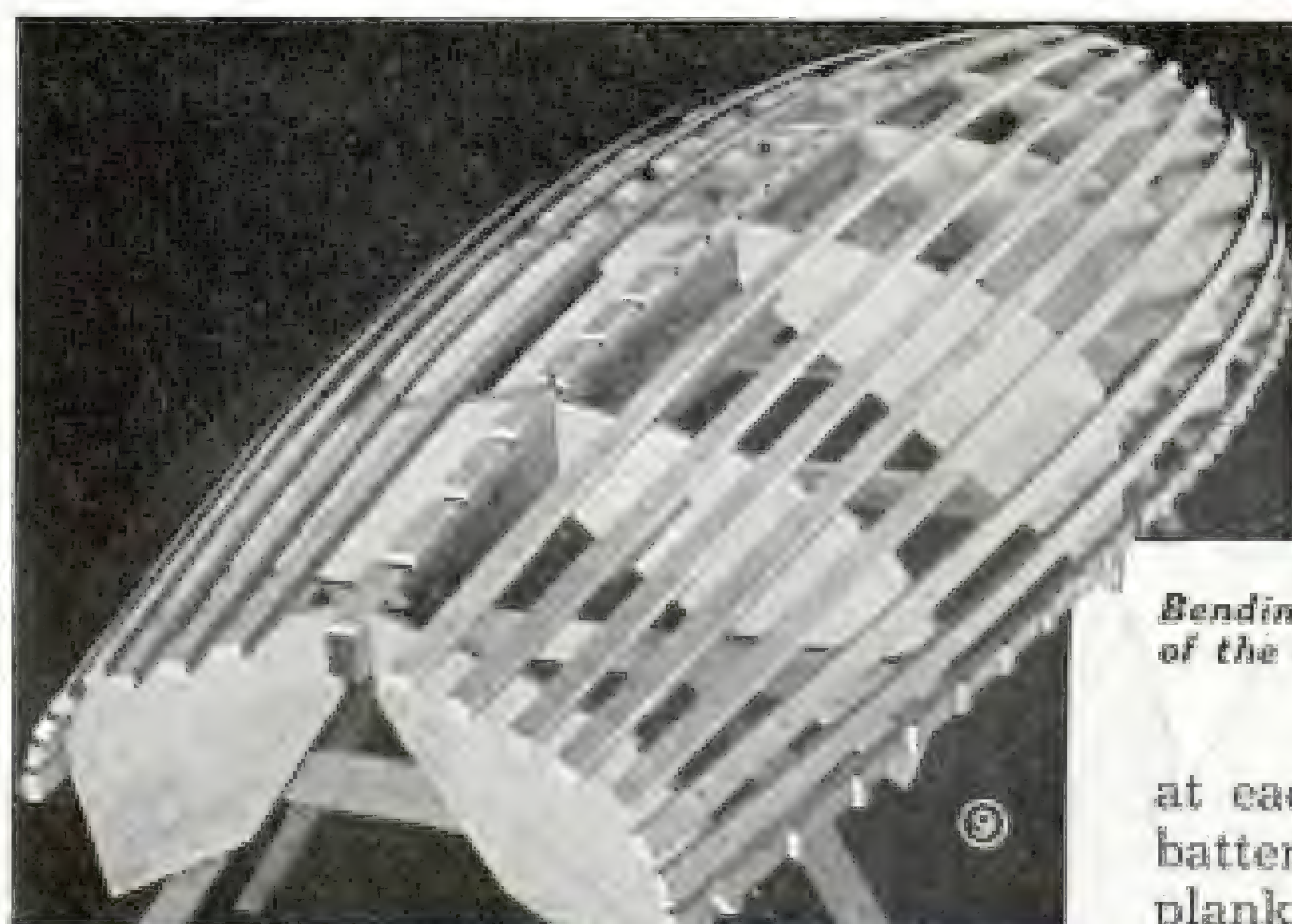
## Part I—Hull Form, Keel and Ribs

**E**XCEPTIONALLY fast in light winds and a stanch performer in heavy weather, "Arrowhead" is especially designed for conditions found on the smaller inland lakes, though she's at home on either salt or fresh water. With a length of 21 ft., Fig. 20, and a beam of 5 ft. 11 in. she makes a splendid family boat with room for eight or ten passengers. The hull, moreover, is a particularly suitable type for the amateur boat builder because it is built over a form. With the form right, you can't go wrong on the hull.

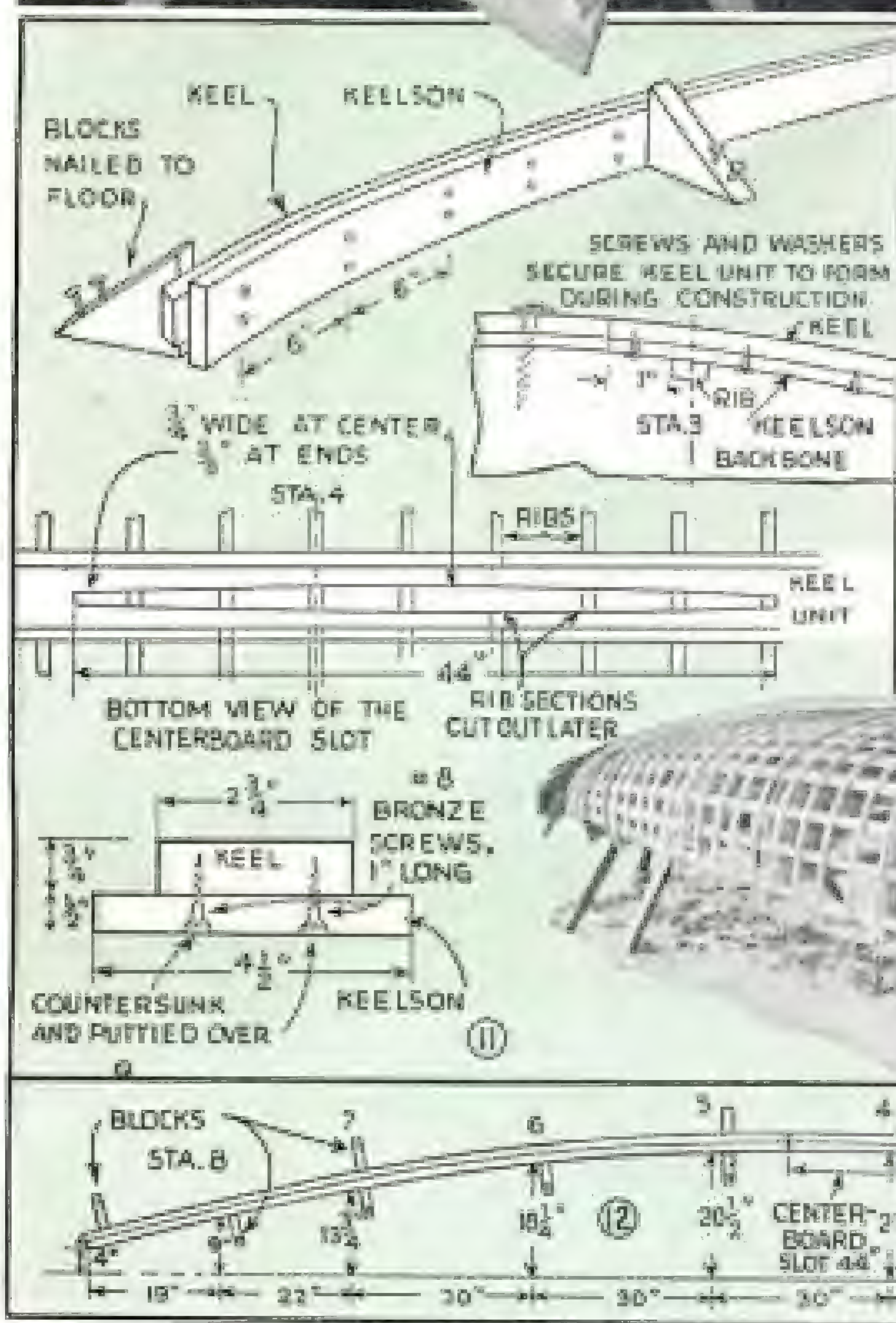
First of all, get large sheets of clean, smooth wrapping paper, pasting enough sheets together to lay out the plans full size as in Figs. 1 and 5. After the plans are drawn, tack the sheet to the floor near your work space so that it will be handy to refer to as you go along. The backbone of the form, Fig. 2, is cut from a piece made up of two 2 by 8-in. planks, cleated together as shown. This is sawed to the curve of the keel and notched every



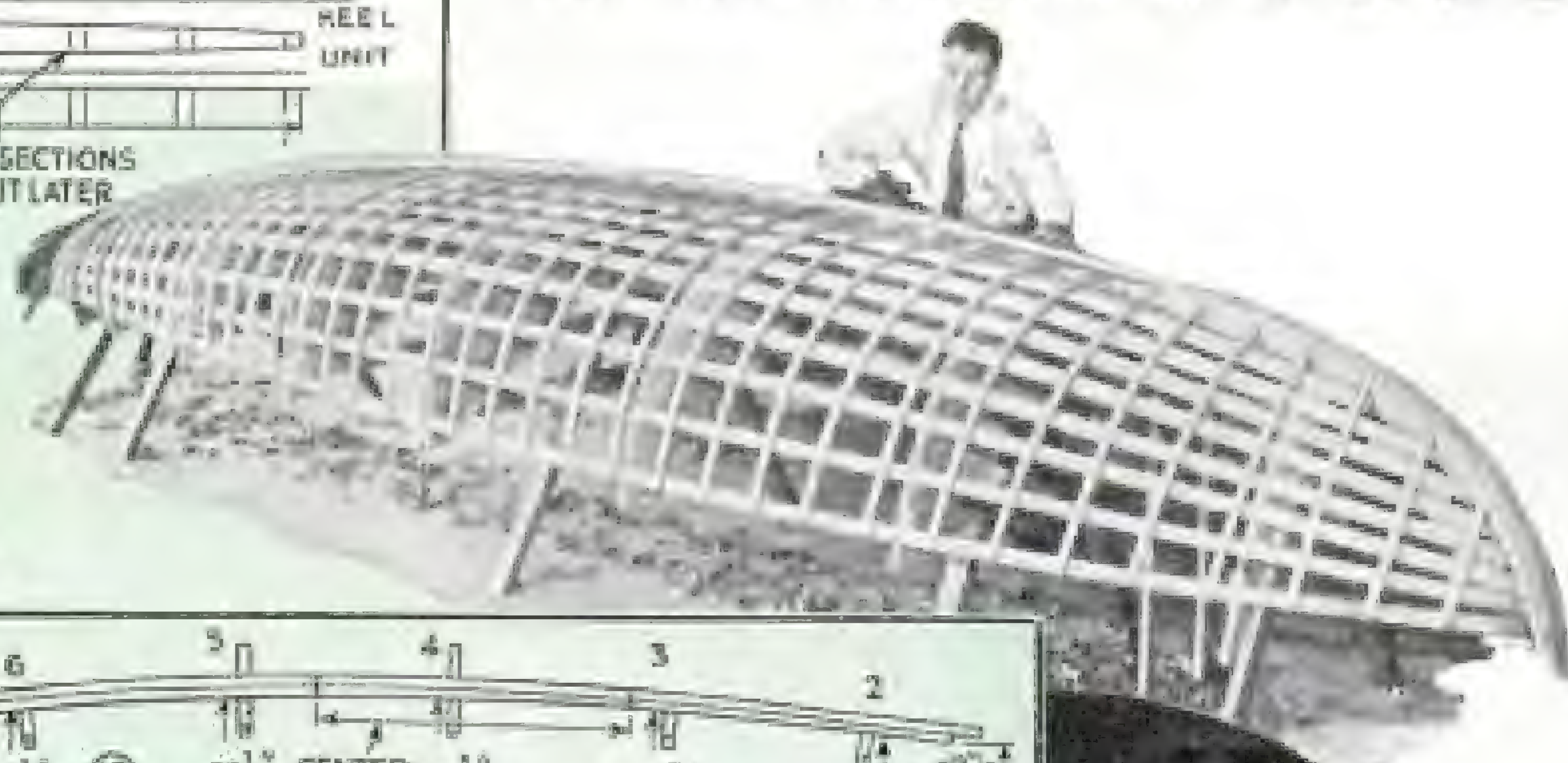




*Bending the oak ribs is not difficult if you use either of the methods above. At the left you see the form ready for ribs and keel*



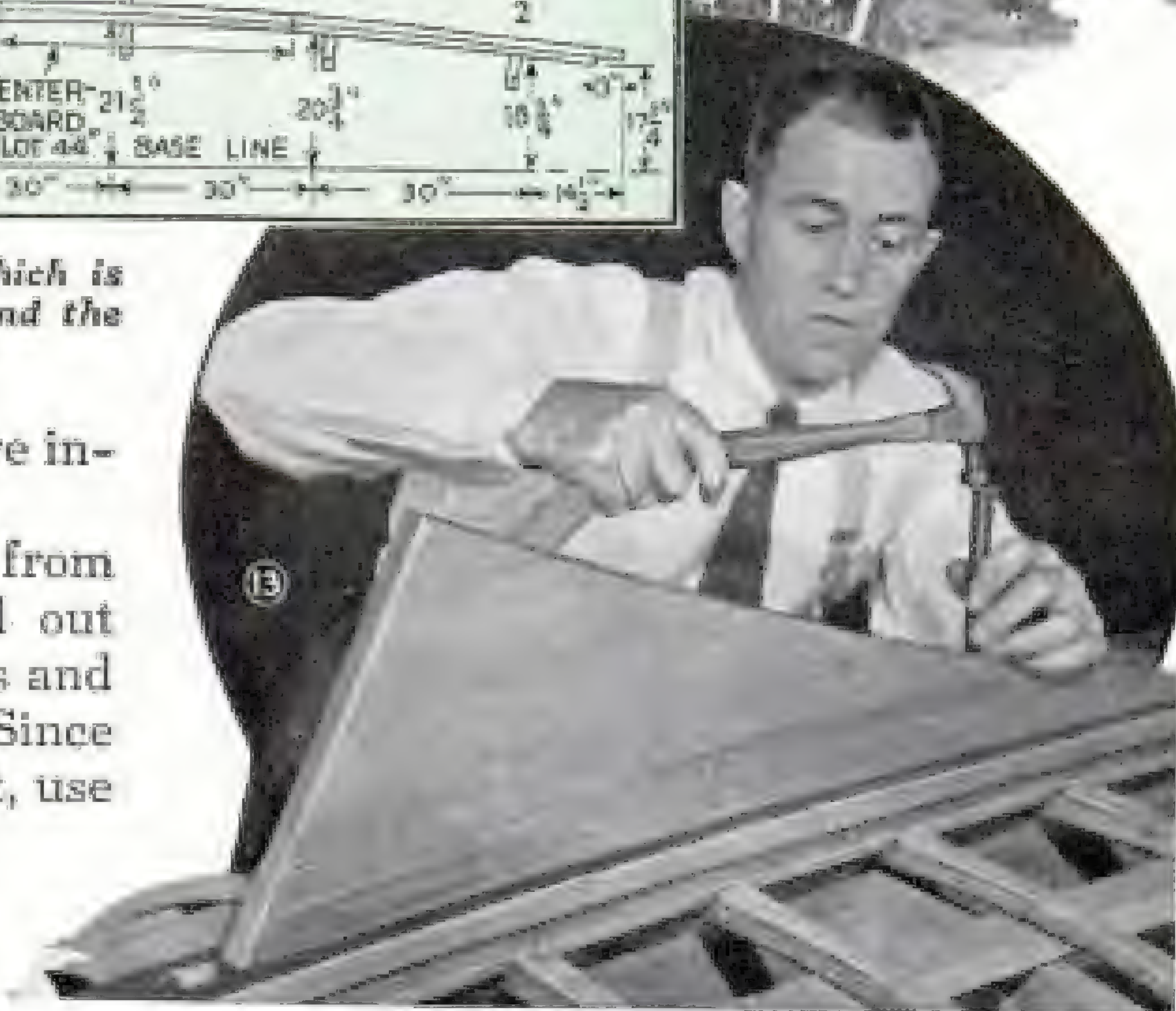
at each station to cover the thickness of battens on the form, the ribs and the planking itself. Erect the backbone on slanting supports so that the lower edge is exactly parallel with the floor and 33 in. above it. Use five pairs of legs for this purpose, at stations Nos. 1, 2, 4, 7 and 8, and nail on the pairs of form molds at the stations designated, in the manner shown in Figs. 2, 6, 7 and 8. Note that the form molds join the backbone just at the bottom of the notches, and station No. 8 only is between two notches, Figs. 2 and 6. This form does not extend aft as far as the



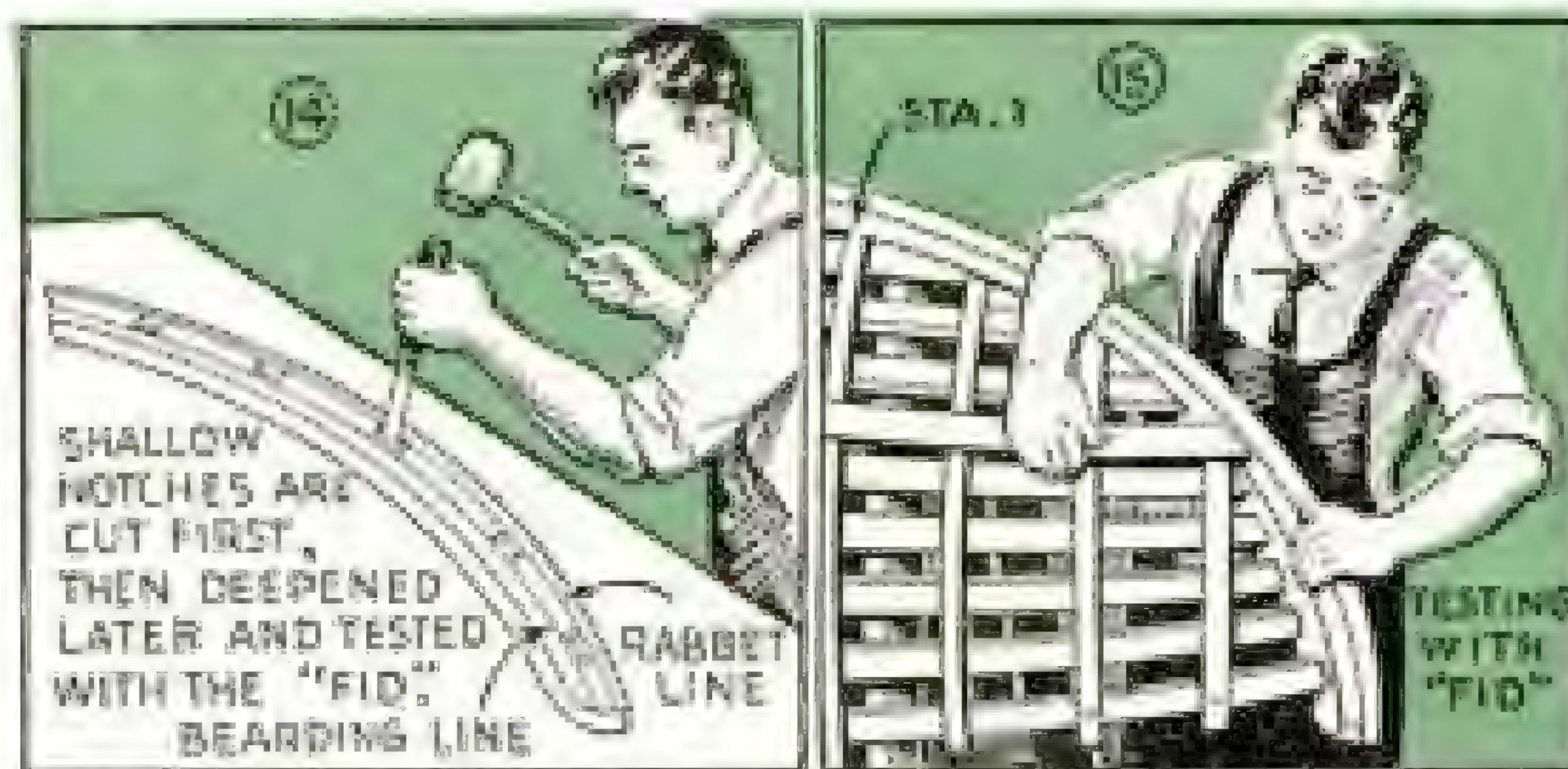
*Actual construction begins with the keel, which is made up of two members, the keel proper and the keelson. Both parts are selected oak*

6 in. to receive the bent ribs, which are installed later in construction.

Next cut the station molds in pairs from the full-size profiles you have laid out from Fig. 3. These are made in pairs and can be cut from any 1-in. material. Since they do not become a part of the boat, use cheap lumber. Note from the squared diagram that the dimensions to the outside of the planking are determined by adding  $2\frac{1}{16}$  in.



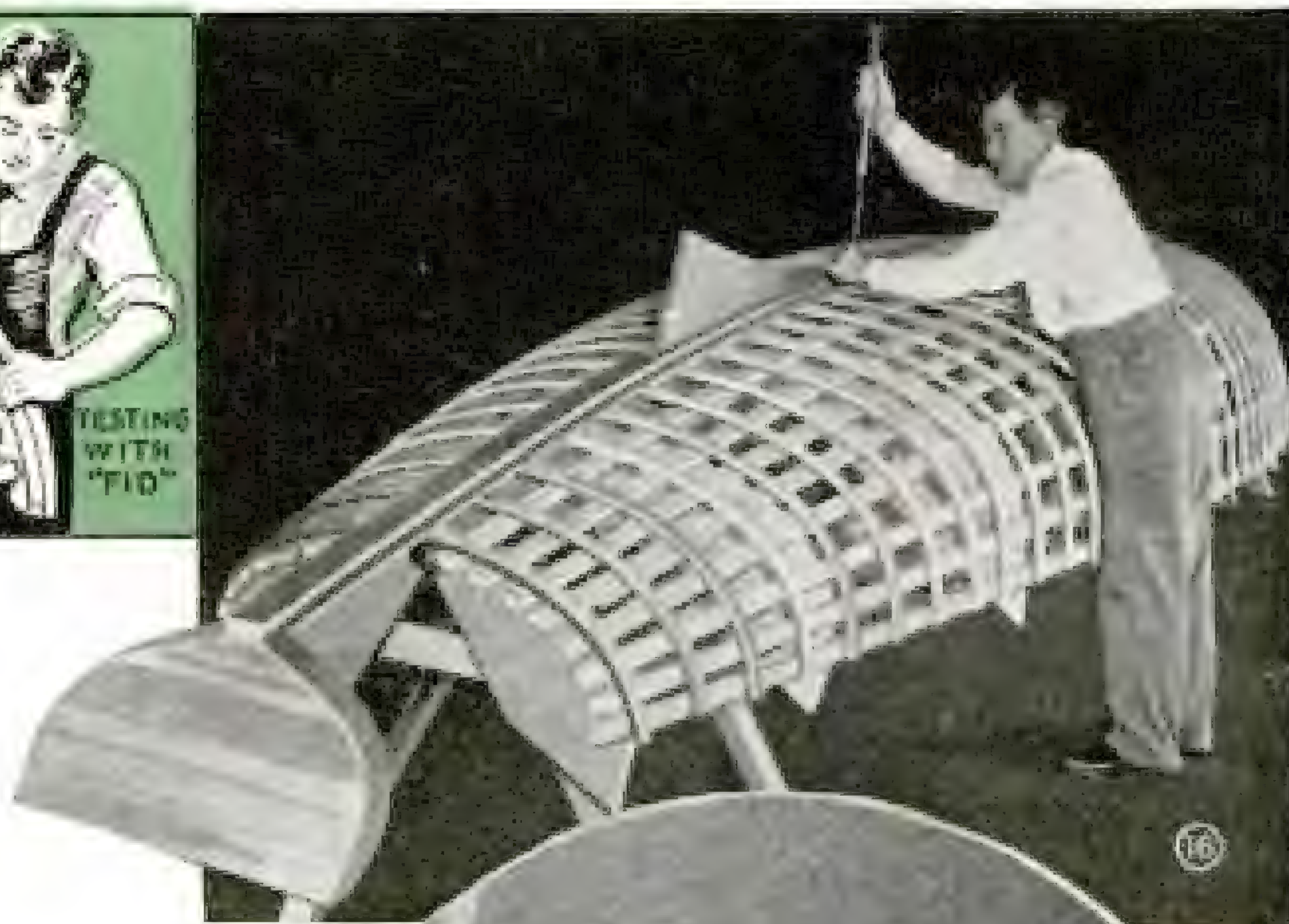




stern, the reason for which will be explained later. Pine battens,  $\frac{7}{8}$  by  $1\frac{1}{2}$  in., are now nailed to the station molds. There are eight of these to a side, equally spaced, as in Fig. 9.

Here is an important point: Before nailing on the battens, mark the sheer line on the form molds. This you get by measuring the distance from the floor as in Fig. 2. Space the two bottom battens so that the line comes between them. The forward ends of the battens do not meet at the stem, as a space must be left here to admit the stem piece, as in Figs. 8 and 15. Also station No. 1 has a gap for the same purpose.

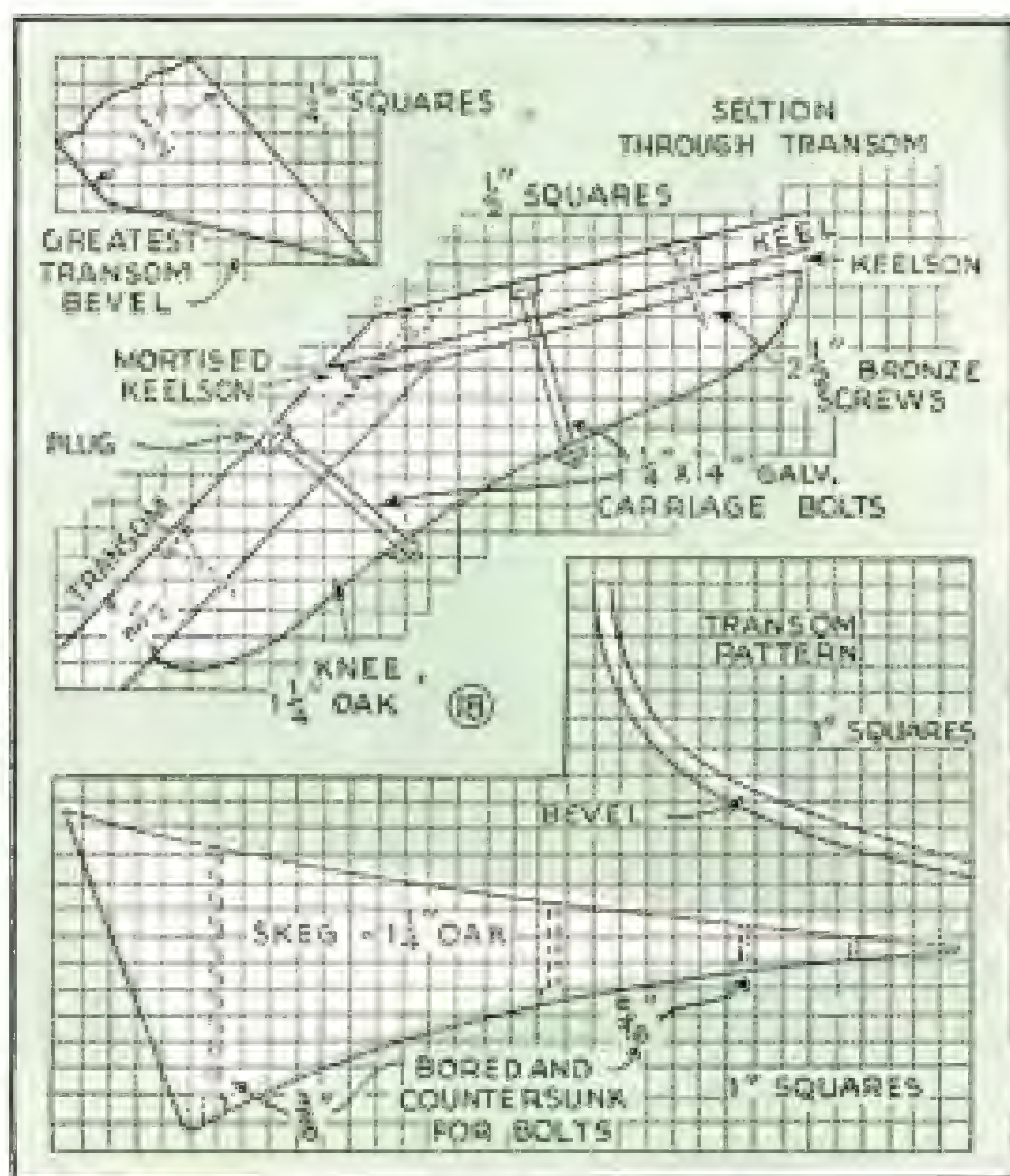
The keel is built up of two members, the true keel and the keelson, as in Fig. 11. Both parts should be oak, bent to the same curve as in Fig. 2, with the full dimensions given in Figs. 11 and 12. Each of the pieces is 18 ft. long, and they must be screwed together in the bent position. To do this, nail blocks to the floor and fit the



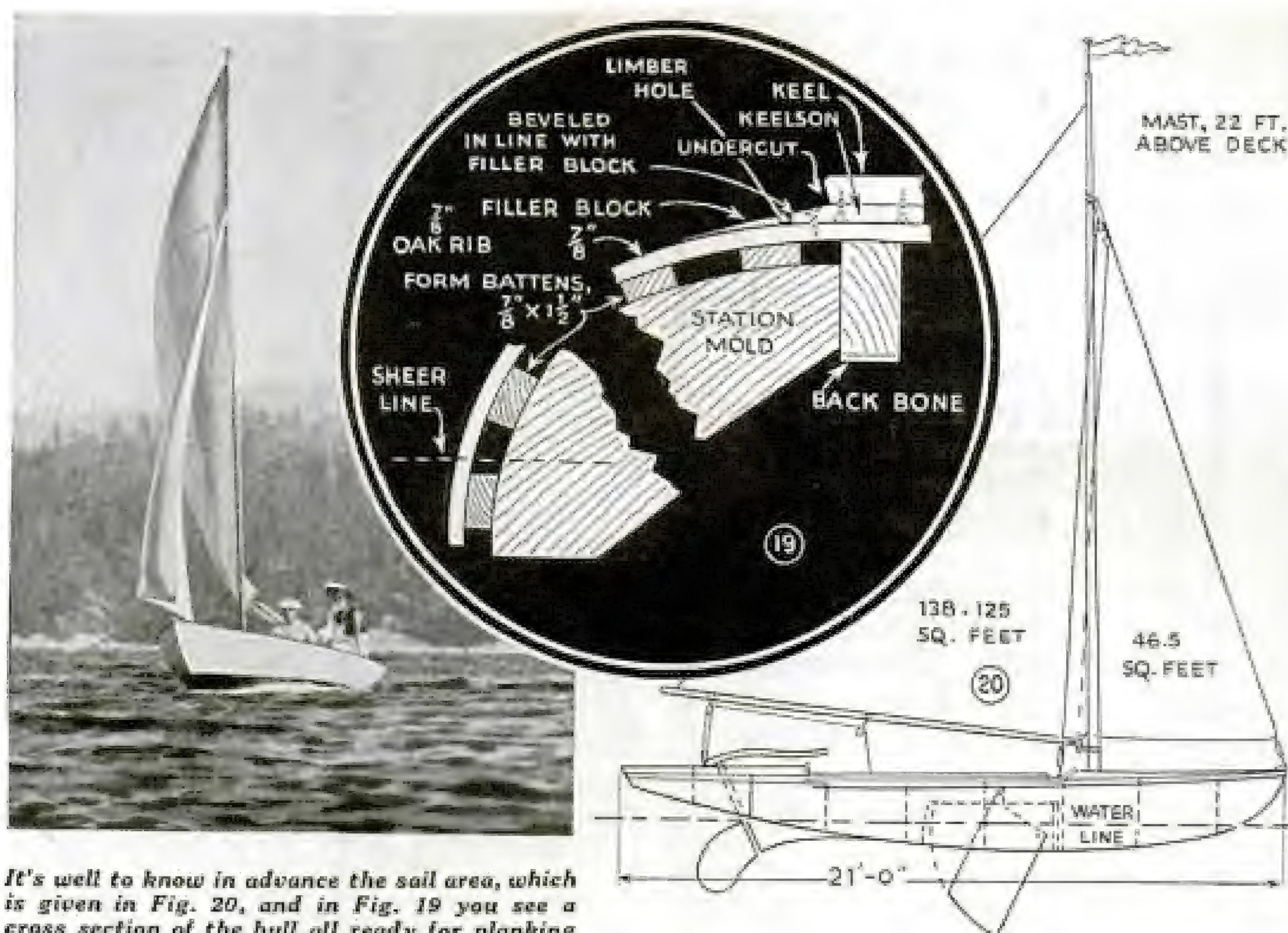
*Here's the way you progress with the hull. Above you see the keel, ribs and transom in place and the stem being fitted. Below in Fig. 17 is a very important detail. The bevel of the keelson must coincide with the slope of the filler block so that you get an even bearing for the plank*

pieces as in Fig. 11. The screws are set in a double row, 6 in. apart, and should be spaced to come between the ribs. The slot for the centerboard must be cut before putting the keel unit on the form. Location and dimensions are given in Fig. 11. Note that the slot is wider in the center than at the ends.

Installation of the ribs comes first. The ribs are  $\frac{5}{8}$  by  $\frac{7}{8}$ -in. oak, in 9-ft. lengths. They must be steamed for at least half an hour. Two suggestions for boiling or steaming are given in Fig. 10. The ribs are placed directly in the water, and when removed are bent over the form as soon as cool enough to handle. Lay one in a notch in the backbone to locate it, then bring down the ends and clamp and nail to the lowest batten. With the ribs in place, you install the keel unit with screws and washers through the centerboard slot to hold it in position while the screws through the keelson into the ribs are being driven. That







*It's well to know in advance the sail area, which is given in Fig. 20, and in Fig. 19 you see a cross section of the hull all ready for planking*

portion of the keelson extending beyond the keel, Figs. 17 and 19, is now beveled so that, when a plank is laid over it and the filler block, it will lie flat. This should be done very accurately.

The stem is cut from a piece of oak  $2\frac{3}{4}$  by 12 in. by 5 ft., as laid out in Fig. 4. Between the rabbet and bearding lines is the long groove or rabbet into which the planking fits. The best way to make this groove accurately is to notch at intervals with a chisel, as in Fig. 14, testing for depth with a "fid" as in Fig. 15. This is merely a strip 1 in. wide and long enough to reach back to station No. 1. The fid will also serve as a guide in beveling the portion between the rabbet and the face. Secure the keel to the stem with four  $\frac{5}{16}$ -in. bronze bolts and drill a  $\frac{3}{8}$ -in. hole in the joint where indicated for the "stopwater," Fig. 4, a white-pine dowel, which will swell and close this joint tightly.

Philippine mahogany makes a durable transom, the latter being cut from a piece 14 by 30 in. by  $1\frac{1}{2}$  in. thick. This gives a wide bearing for planking as well as the keel. You find the transom pattern in Fig. 18. It should be sawed to the greatest bevel, thus leaving enough stock to work

down later. Bear in mind that the pattern in Fig. 18 will not coincide with the projection of the transom in Fig. 3 as the latter is set at an angle of nearly 45 degrees.

The transom is mortised for the keelson, but not the keel, as shown in Fig. 18. An oak knee is bolted to the keel and transom and is further secured by braces down to the floor, as in Figs. 16 and 18.

Fig. 18 gives the pattern for the skeg, which is secured to the keel with two galvanized carriage bolts and two screws as in Figs. 13 and 16. The after edge of the skeg gives the angle of the rudder post, and serves as a guide in boring the  $1\frac{3}{16}$ -in. hole for the rudder post tube, Fig. 21.

Now each of the ribs must be "faired off," so that the first plank on each side of the keel will be flat. The best way to do this is with a long batten laid over the ribs the full length of the hull. The batten should be of thin stock so that when clamped at the ends it will take the curve of the hull easily. From this you can determine the amount of waste to be taken off each rib. Use a sharp draw-shave or a block plane and begin at the keel and work outward, moving the batten as you go along. The essential thing is to make



sure that the batten bears equally on each rib. This means that at stations fore and aft you will have to bevel the ribs considerably and the degree of the bevel will vary somewhat from the keel to the sheer line. Each individual rib is faired off so that the batten bears its full width. Should any of the ribs be left with the batten touching only one corner, an imperfect joint between the rib and the plank will result. A condition of strain will exist which is likely to either split the plank or pull the screws through it. You should be particular with those ribs between the stem and station No. 3, for it is here that the greatest curve comes in the planking. The bevel on the transom should be faired back from the keel only the width of the first two or three planks as there is a point in connection with this bevel that will be covered in the second installment.

## MATERIAL LIST

### LUMBER FOR FORM

- Backbone—2 pieces 2 by 8 in. by 16 ft. 1 in. Pine.  
 Station molds—5 pieces 1 by 14 in. by 12 ft. Pine.  
 Battens—16 pieces  $\frac{3}{8}$  by  $1\frac{1}{2}$  in. by 19 ft. Spruce.  
 Miscellaneous lumber for cleats, legs, etc.

### LUMBER FOR HULL FRAME

- Stem—1 piece 3 by 12 in. by 5 ft. Oak.  
 (Skeg and transom knee cut from waste)  
 Transom—1 piece  $1\frac{1}{2}$  by 14 by 30 in. Mahogany.  
 Keel—1 piece  $\frac{3}{4}$  by  $2\frac{3}{4}$  in. by 18 ft. Oak.  
 Keelson—1 piece  $\frac{1}{2}$  by  $4\frac{1}{2}$  in. by 18 ft. Oak.  
 Ribs—36 pieces  $\frac{3}{8}$  by  $\frac{3}{4}$  in. by 9 ft. Oak.

### FASTENINGS

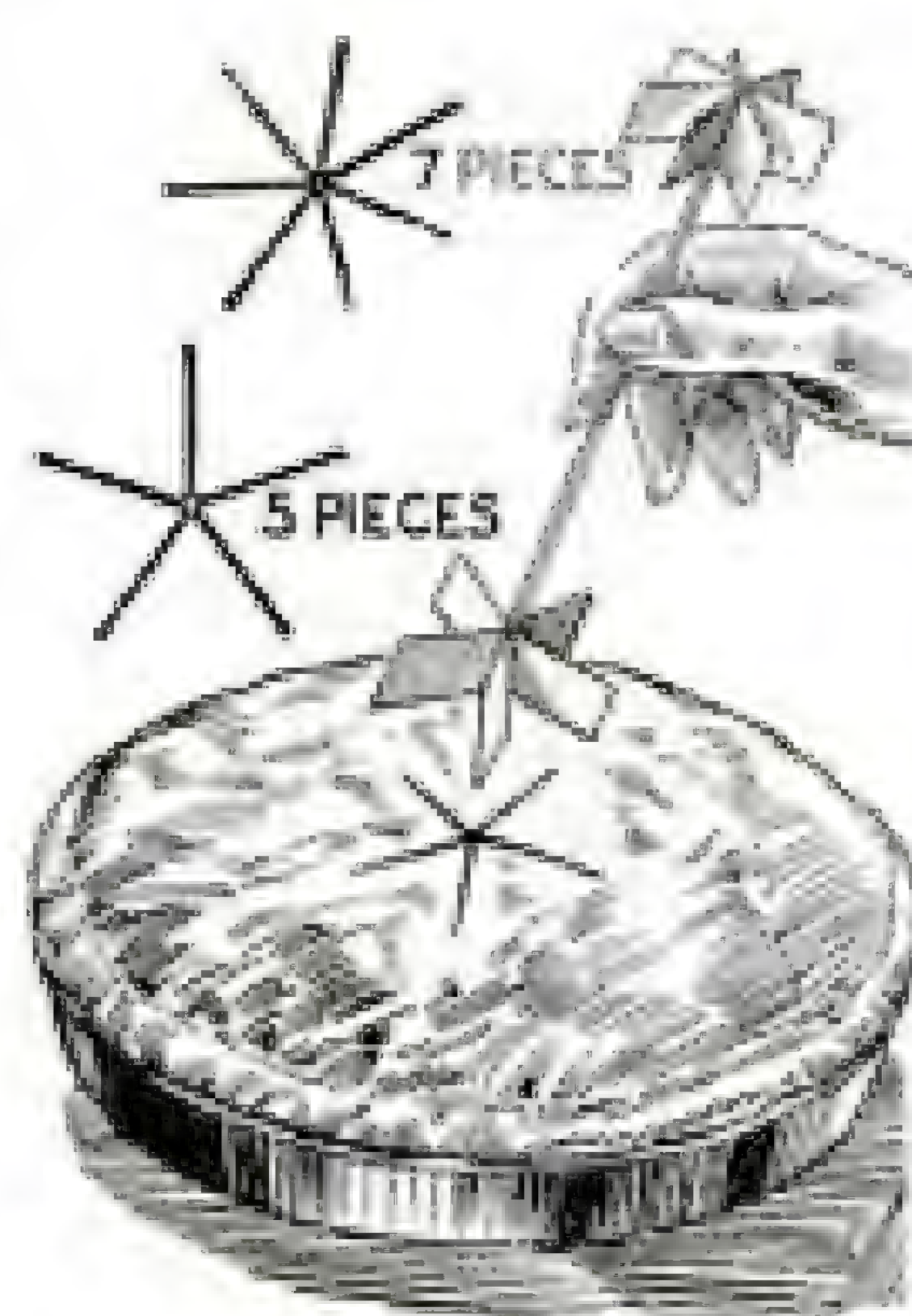
- 6 doz. No. 8 bronze screws, 1 in. long, Keelson to keel.  
 6 doz. No. 7 bronze screws,  $\frac{3}{4}$  in. long, Keelson to ribs.  
 2 only No. 9 bronze screws,  $2\frac{1}{2}$  in. long, Keel to transom.  
 2 only No. 9 bronze screws, 2 in. long, Knee to transom and keel.  
 2 only No. 9 bronze screws, 2 in. long, Skeg to keel.  
 2 only carriage bolts (galv.)  $\frac{1}{4}$  by 4 in., Transom knee.  
 1 only carriage bolt (galv.)  $\frac{1}{4}$  by 5 in., Skeg to keel.  
 1 only carriage bolt (galv.)  $\frac{3}{8}$  by 12 in., Skeg to keel.  
 5 only carriage bolts (bronze)  $\frac{1}{4}$  by 4 in., Stem to keel unit.



About the last thing you do before planking is to bore the hole for the rudder post as in Fig. 21. The after end of the skeg is used as a guide

## Pie Marker Assures Equal Pieces

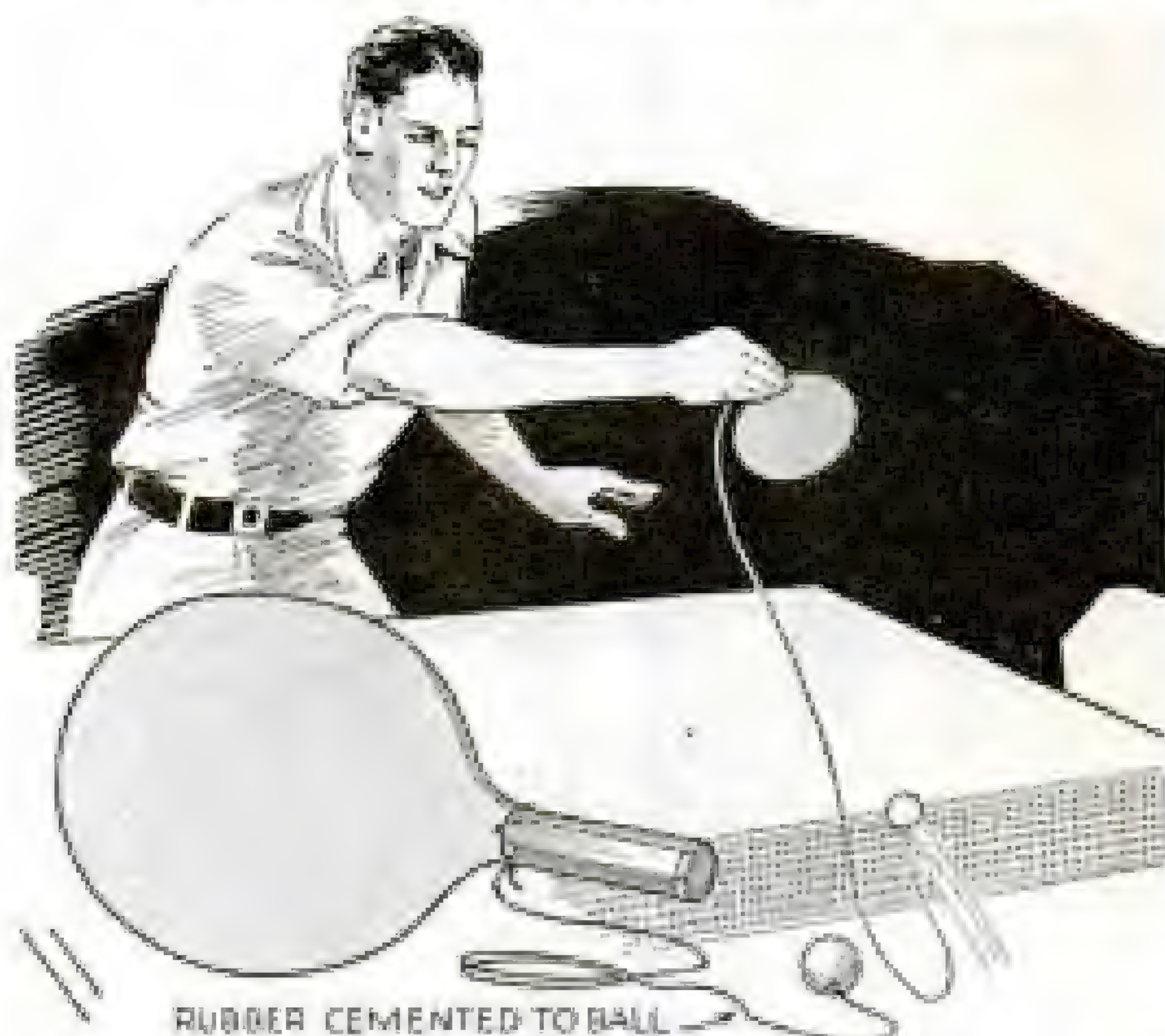
Assembled from wire and tin, this marker takes the guesswork out of cutting pies, and assures that all pieces will be the same size. To get the tin pieces spaced evenly on the wire, scribe a circle on a piece of paper and lay off the circumference in the



required number of divisions with a pair of dividers. Then, using the paper as a pattern, hold the wire vertically in the center of the circle and solder the tin markers in place, using fairly heavy tin so that the markers will hold their shape.



## Practicing Table Tennis Alone with Aid of Rubber String

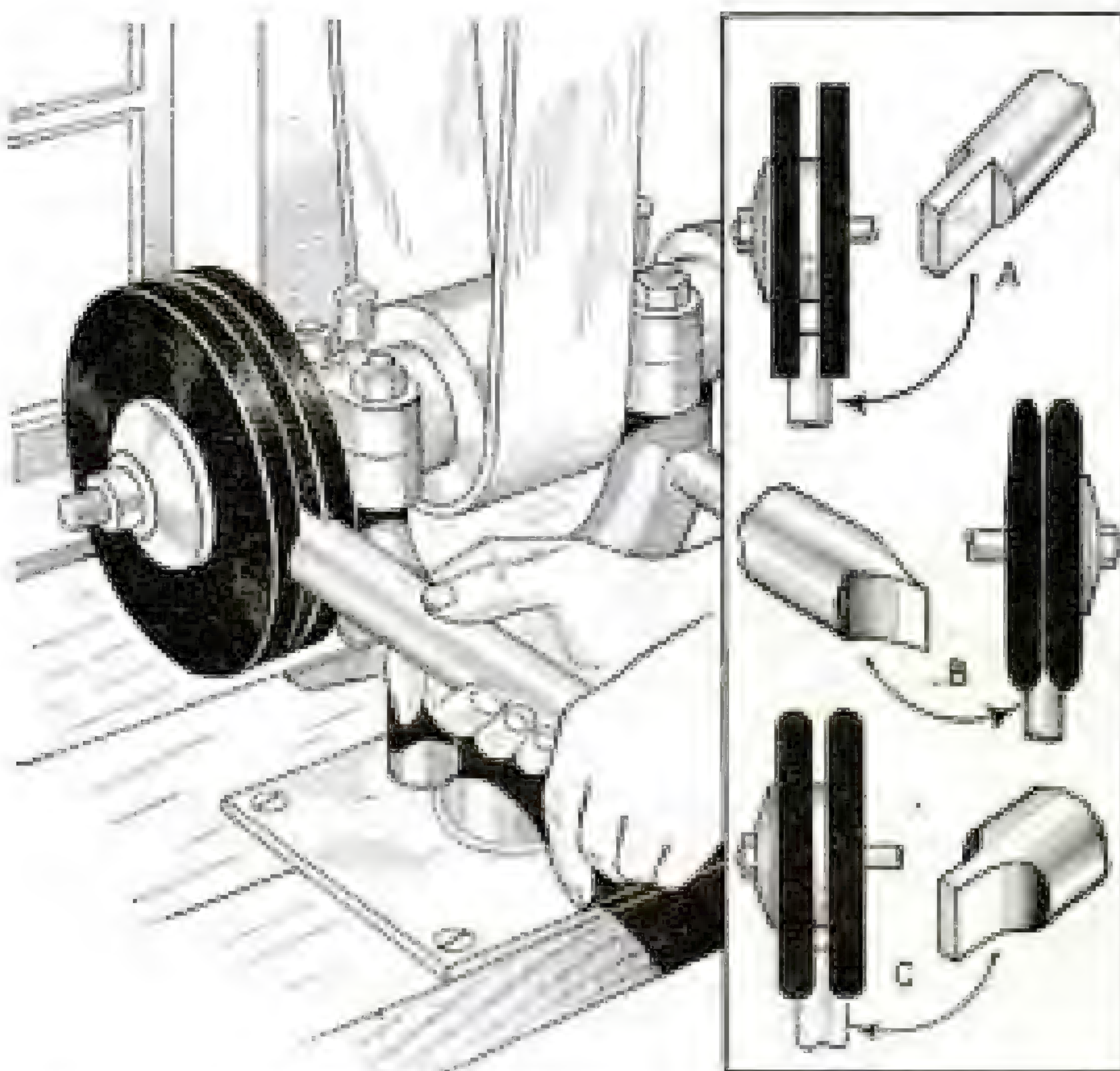


*Rubber string tied to paddle and cemented to ball returns latter when driven across table*

If you need a little practice in table tennis, here is the way to get it alone without having to run all over the game room after the ball. Simply cement one end of a long rubber string to the ball and tie the other end to the handle of your paddle. Then you can drive the ball across the table and return it with the string.

## Spaced Abrasive Wheels Grind Points on Steel Rods

By placing two abrasive wheels side by side on a grinder shaft and spacing them with a large washer, ends of rods can be



*A few of the shapes you can grind on rods with a couple of spaced abrasive wheels*

pointed, beveled or shouldered. Besides the operations A, B and C shown in the detail, many others will suggest themselves once the wheels are put into use. For pointing and beveling, round-faced wheels are used, while most shouldering work will require flat-faced wheels. A tool rest must be used to support the rods, and care must be taken to hold them true, to keep the work from binding between the wheels, which might break one of them and injure the operator.

## Tool for "Setting Out" Plants Made from Tin Can



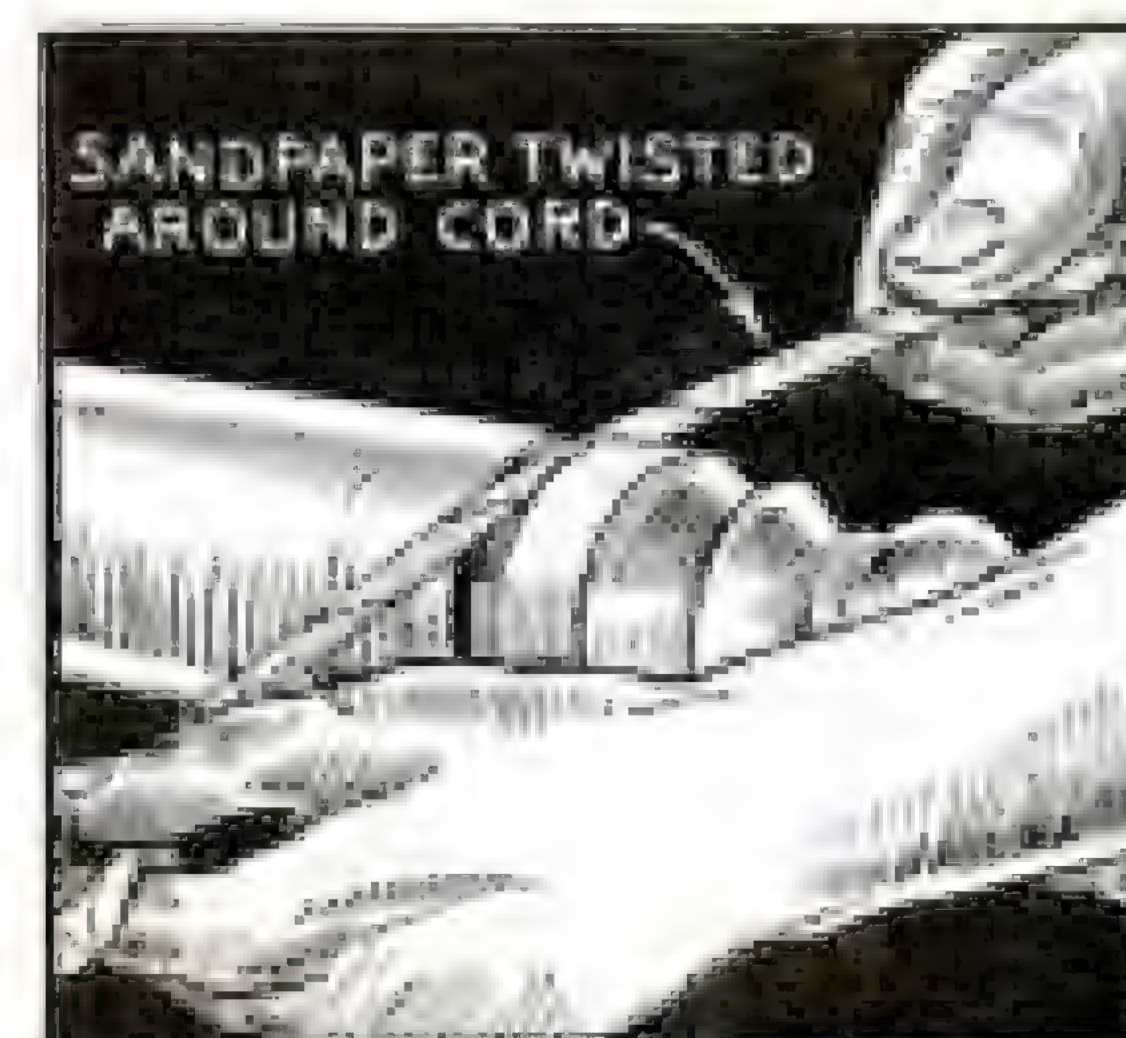
Time and labor can be saved when transplanting vegetables, flowers and small shrubs by using this tool to make the holes in the ground. It is merely a tin can having both ends removed and a U-shaped piece of flat iron riveted to the upper end for

a handle. The lower edge of the can should be sharpened with a file so that it can be pushed into the ground easily.

## Sandpaper on Cord Smooths Irregular Lathe Turnings

For sanding irregular surfaces of a lathe turning, twist a narrow strip of sandpaper in a spiral around a length of stout cord. This provides a flexible, abrasive surface

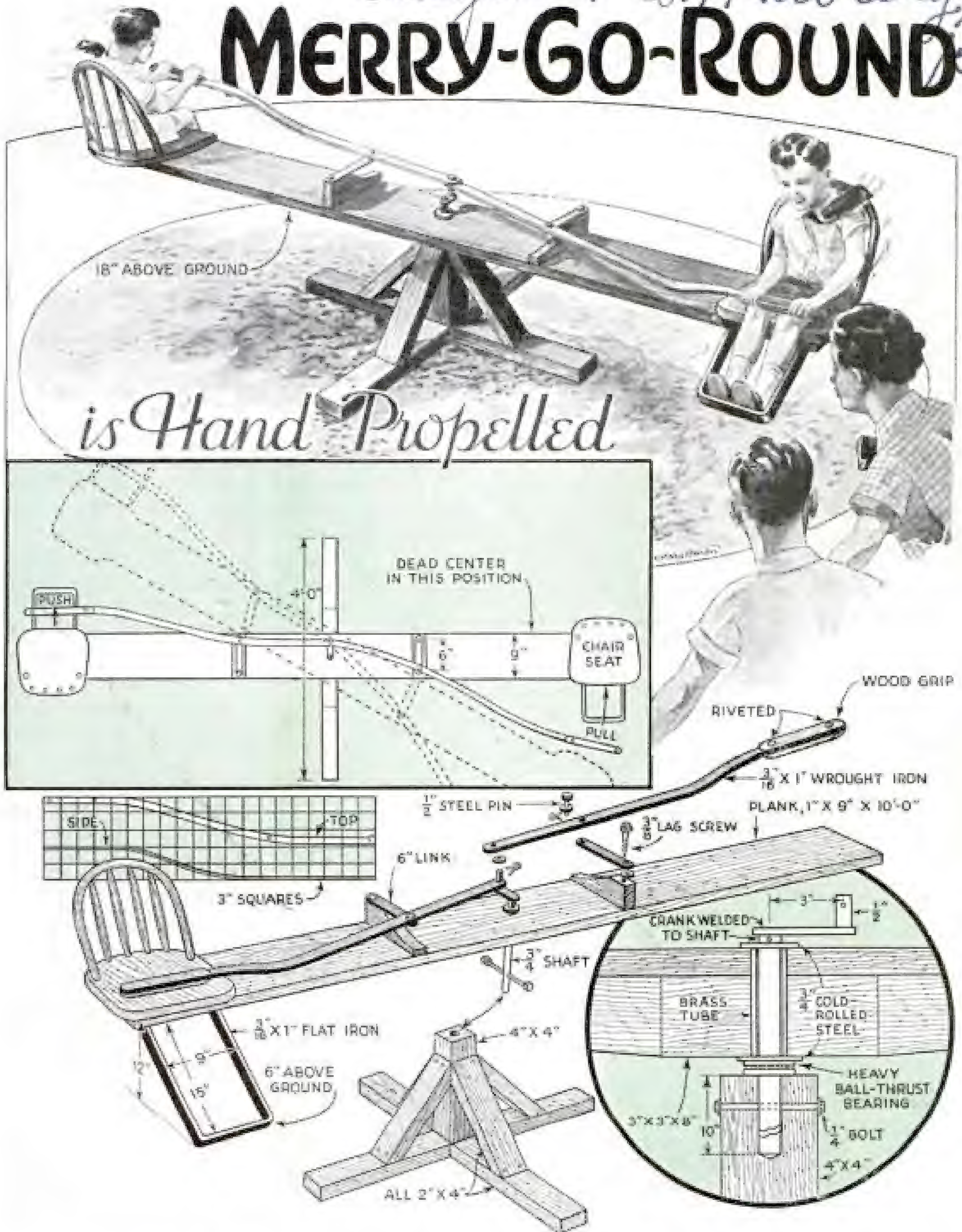
that gets into narrow grooves. The ends of the sandpaper strip may be held on the cord with the fingers or they can be attached with short pieces of adhesive tape.



Paint stains are removed easily from the hands if they are rubbed with vaseline before starting the paint job.



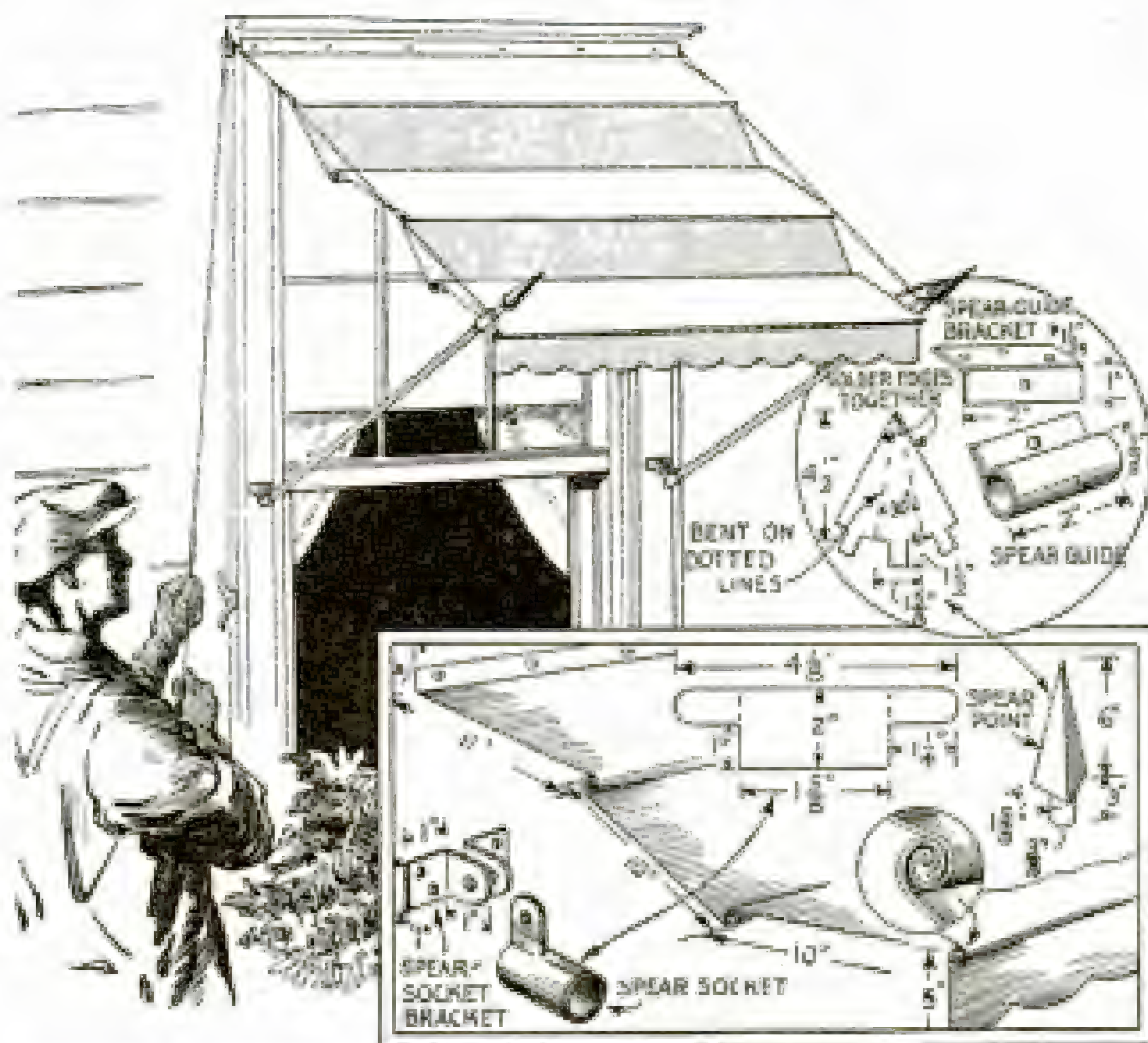
# Hand propelled for playgrounds Clayton & Co., Hill City, **MERRY-GO-ROUND** *Kans*



Operated something like a railroad hand car, this merry-go-round not only offers beneficial exercise, but it is inexpensive and is easy on shoes. It consists of a well-braced standard, a strong plank and two seats. A steel shaft, pinned rigidly to the standard, passes through a bushed hole in the center of the plank, and a crank, having a 3-in. throw, is welded to the upper end. Or, a longer shaft can be used and a crank bent on the end. Friction between the plank and the standard is reduced to a minimum with a ball thrust bearing. For the seats, old chairs are used, the leg assemblies having been removed. U-shaped footrests of flat iron are bolted under the seats to project downward at an angle. Push handles or bars, with which the merry-go-round is driven, are lengths of heavy flat iron to which wood handgrips are riveted. A 6-in. link connects each handle to a block screwed to the plank, and permits lateral movement of the bars



## Lifetime Awnings of Sheet Metal for Use All Year



Alternate strips of copper and aluminum give the awnings an attractive striped effect that is permanent

Made from strips of copper or aluminum, this attractive awning is noninflammable and is unaffected by weather. A permanently striped effect can be had by using the two metals alternately. The flex-

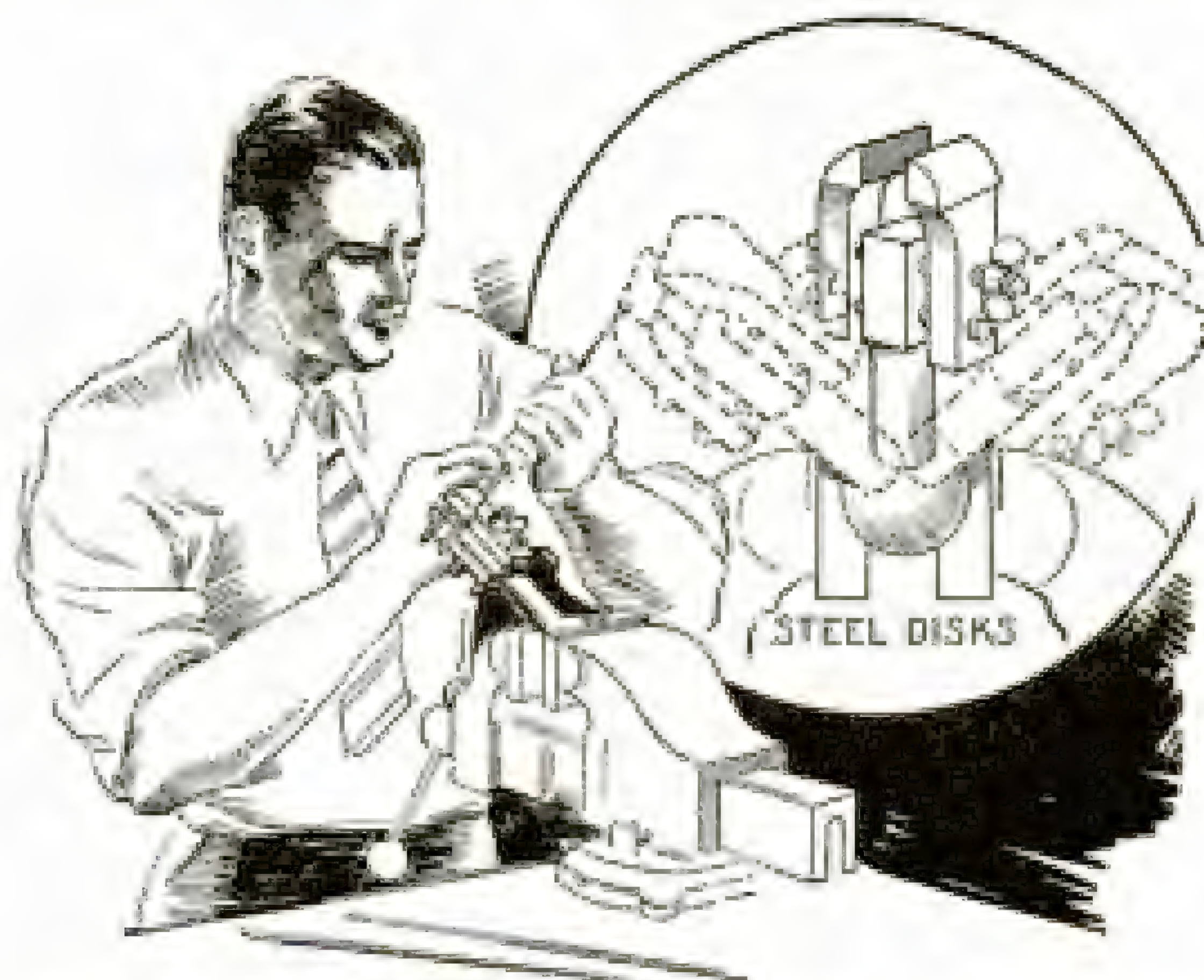
ible joints are interlocking and close just enough to prevent the doubled edge of metal from slipping through. The awnings may be taken down by sliding out the sections endwise. In making them you bend up a 1-in. strip on the upper segment, which is tacked to the window frame with large-head brass or copper tacks closely spaced. Trim the lower edge with a 5-in., free-swinging metal strip cut with a broadly scalloped lower edge. Support the awning with spears made of 1/2-in. wood or metal. Install the upper segment as high as possible on the window frame so that the awning will not obstruct the window when folded. If extreme compactness is essential, use small piano hinges for the flexible joints, fastening them with solder or brass rivets. Alternate segments are hinged to fold in opposite directions so that the folded awning will fit under the fixed

upper segment. To control the awning, rig a cord to each spearhead and run it over small pulleys on the side of the window frame down to a small cleat placed within easy reach.

## Small Hand Vise Swivels to Almost Any Working Angle

Clamped between two steel disks in a bench vise, this small hand vise can be swiveled to hold work at any comfortable working angle. The swiveling action is obtained by a 1 1/2-in. steel ball on the end

of the vise stem which moves between two steel disks, each disk having a 1/2-in. hole in its center which is enlarged with a taper reamer. The upper edges of the disks are cut out to clear the stem when the vise is moved from side to side.—Geo. J. Silver, Salt Lake City, Utah.



Modelmakers will find this swiveled vise handy for holding small parts while shaping them

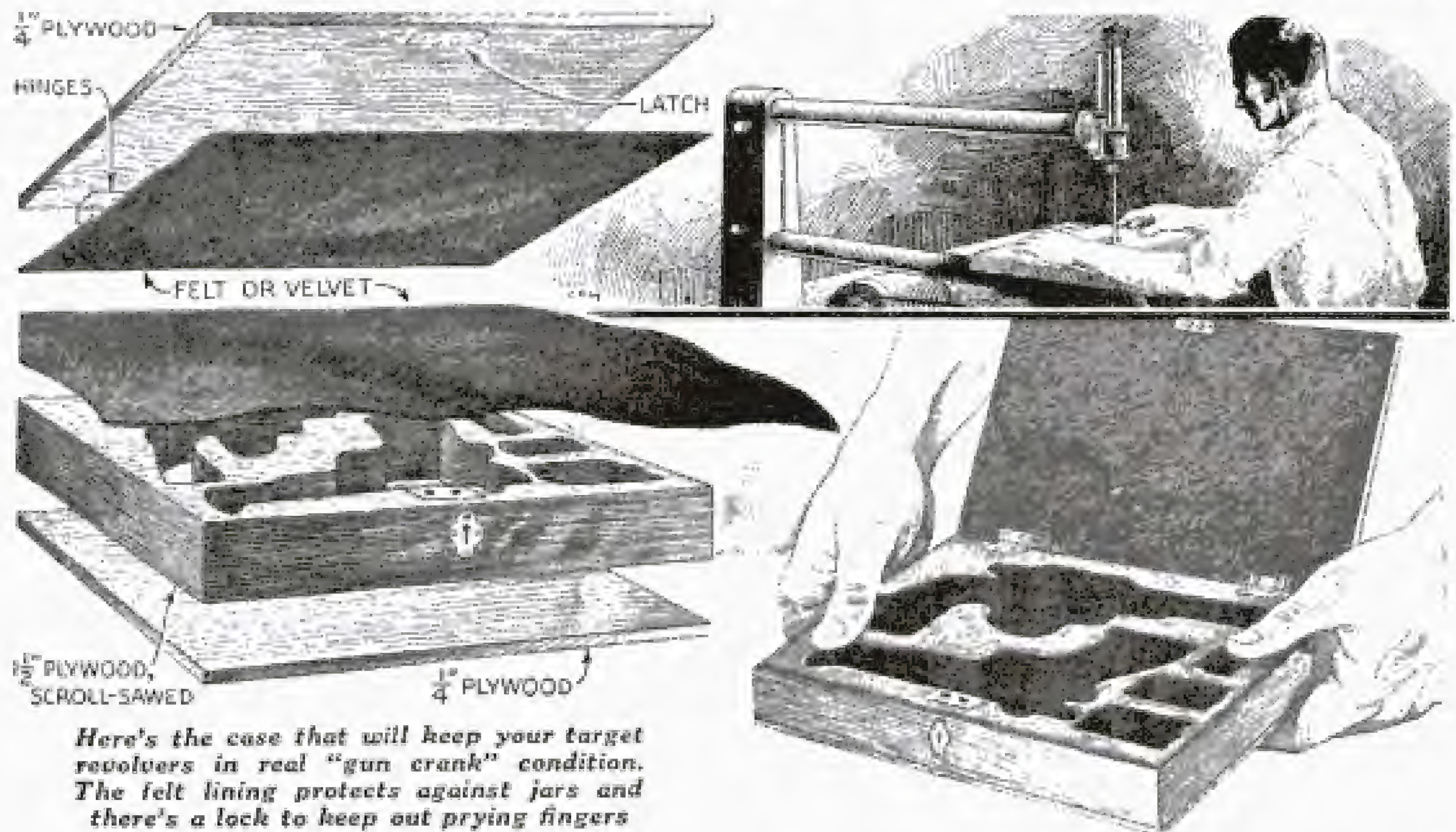
## Extra Pockets in Hunting Coat

Hunters, hikers, fishermen and others who often have temporary need of extra pockets in their coats can improvise them quickly by pinning one or more mittens to the coat lining, as shown.





## Pet Hand Guns Carried in Felt-Lined Case



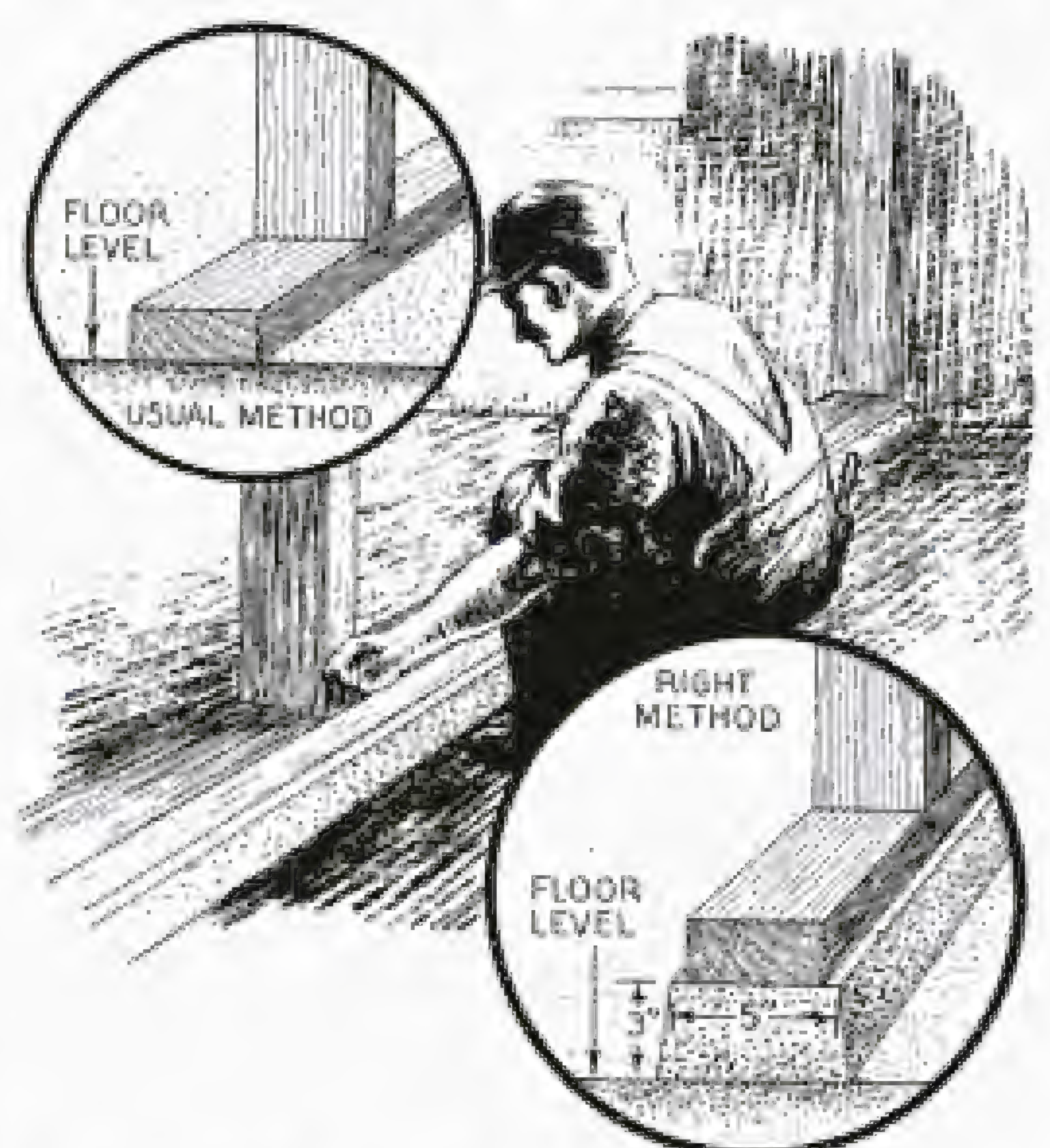
Jigsawed from plywood and lined with felt, this neat case provides safe storage for valuable hand guns, with space for cartridges and accessories. The weapons are laid on a piece of 1½-in. plywood and the outlines carefully marked with a pencil. Then the outlines are cut through with

the jig saw. A bottom piece of ¼-in. plywood is fastened with screws and glue, and a top of the same material is hinged as shown. Upholsterer's felt is then glued to the top and to the inside edges and bottom of the case. If desired, you can fit a cylinder lock as shown.

## Concrete Footing Raises Basement Partitions Off Floors

Instead of laying the wood sill of basement partitions for coal bins, fruit cellars and laundry rooms directly on the floors, permitting moisture to be absorbed into the wood readily, which rots it in a few years, why not take a little more time and make the job a permanent one by putting in concrete footings to raise the sills above the floor? Such footings not only protect the wood from moisture, which accumulates by condensation on most basement floors during summer, but also shield the wood when washing the floor. If you want to go a step further in protection, impregnate the plates and ends of the studs with creosote and use coated nails to join them.

☐ When making enlargements on thin photo paper, best results are obtained by laying the latter on a sheet of black paper to prevent reflection of the image through the back.



Permanency of your basement partitions more than offsets the slight extra cost of the concrete footings



# Home Comforts *in this* FAMILY TRAILER



## Part 3

### Interior Furnishings and Painting

ONE glance at the cutaway view above and you have the whole story of the interior furnishings. There's your kitchen, dining and living room, and two bedrooms with clothes-closet space. When you stop along the road for the night, there's nothing to unpack, no ropes or awnings to bother with. Simply uncouple the trailer from the car and park it in any convenient place. One person handles it easily, even when fully loaded.

Now to finish the job. Remaining exterior details are application of the roof of auto-top canvas and, if you have so decided, a fabric covering of the body. In putting on the latter, you apply the lower half of the wall covering first, then lap the upper half over it, using copper tacks. A strip of auto-fabric binding is tacked over the seam. Fig. 24 gives you the distribution of the material, and the sectional views, Figs. 19 and 20, and the detail in Fig. 21 show what to do when finishing up

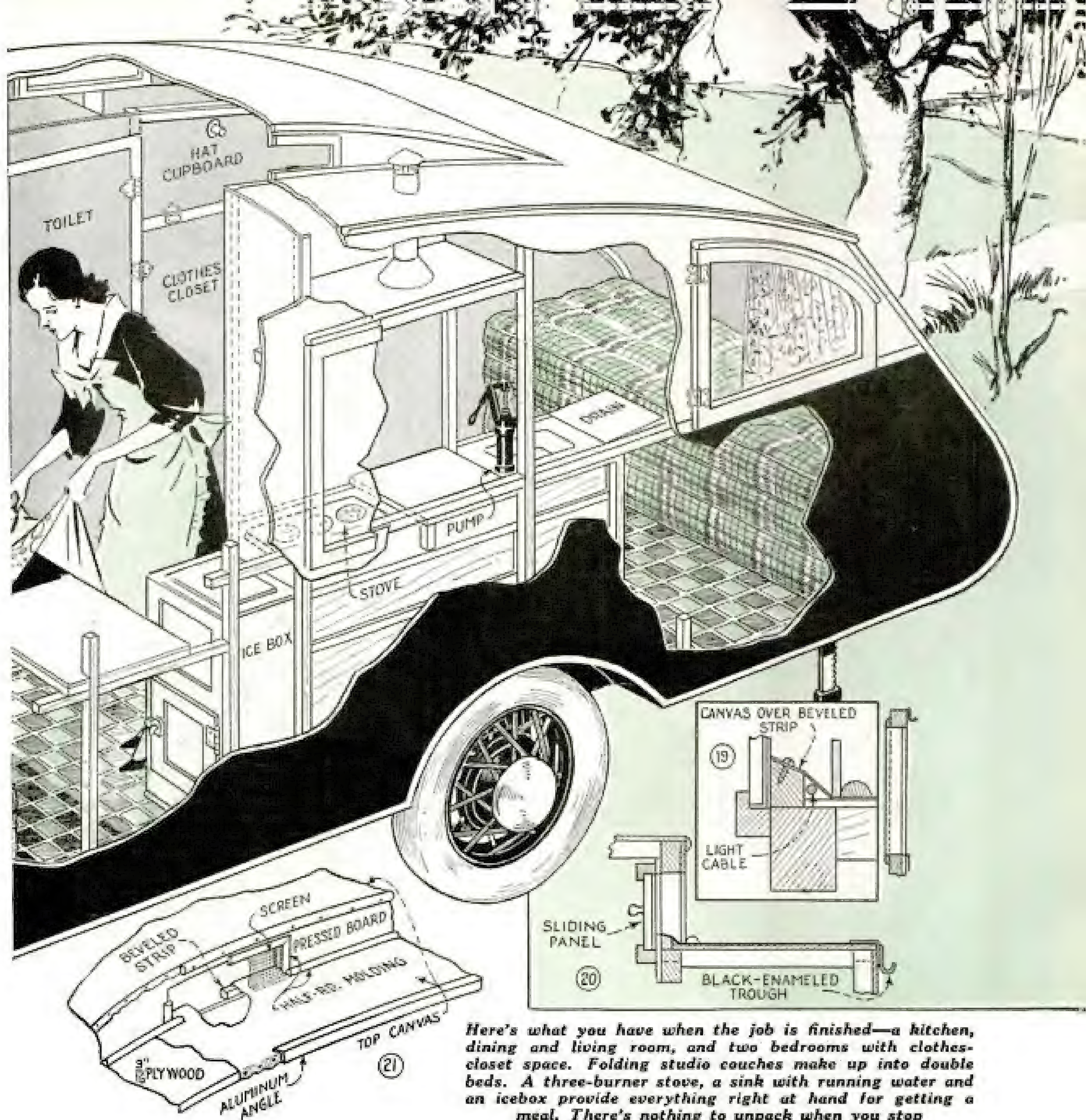


*Selected as being representative of the type trailer many of our readers have desired to see published in Popular Mechanics, this trailer, of which this article is the third and last installment, was designed and built by Mr. C. Hart Collins. We are indebted to him for his kind cooperation in going through the entire construction in detail so that complete information, based on the actual work, could be supplied to our readers*

the top at the outer edge and around the ventilator openings in the sides of the raised center section. Bindings of light aluminum angle are used to finish all corners of the body as in Fig. 18. Where the top canvas overlaps the sides it's a good idea to apply a light coating of marine glue under the seam. Aluminum gutters around the edges of the top finish this part of the job.

Window sash are made of white pine, rabbeted as illustrated in Fig. 23, the cor-





Here's what you have when the job is finished—a kitchen, dining and living room, and two bedrooms with clothes-closet space. Folding studio couches make up into double beds. A three-burner stove, a sink with running water and an icebox provide everything right at hand for getting a meal. There's nothing to unpack when you stop

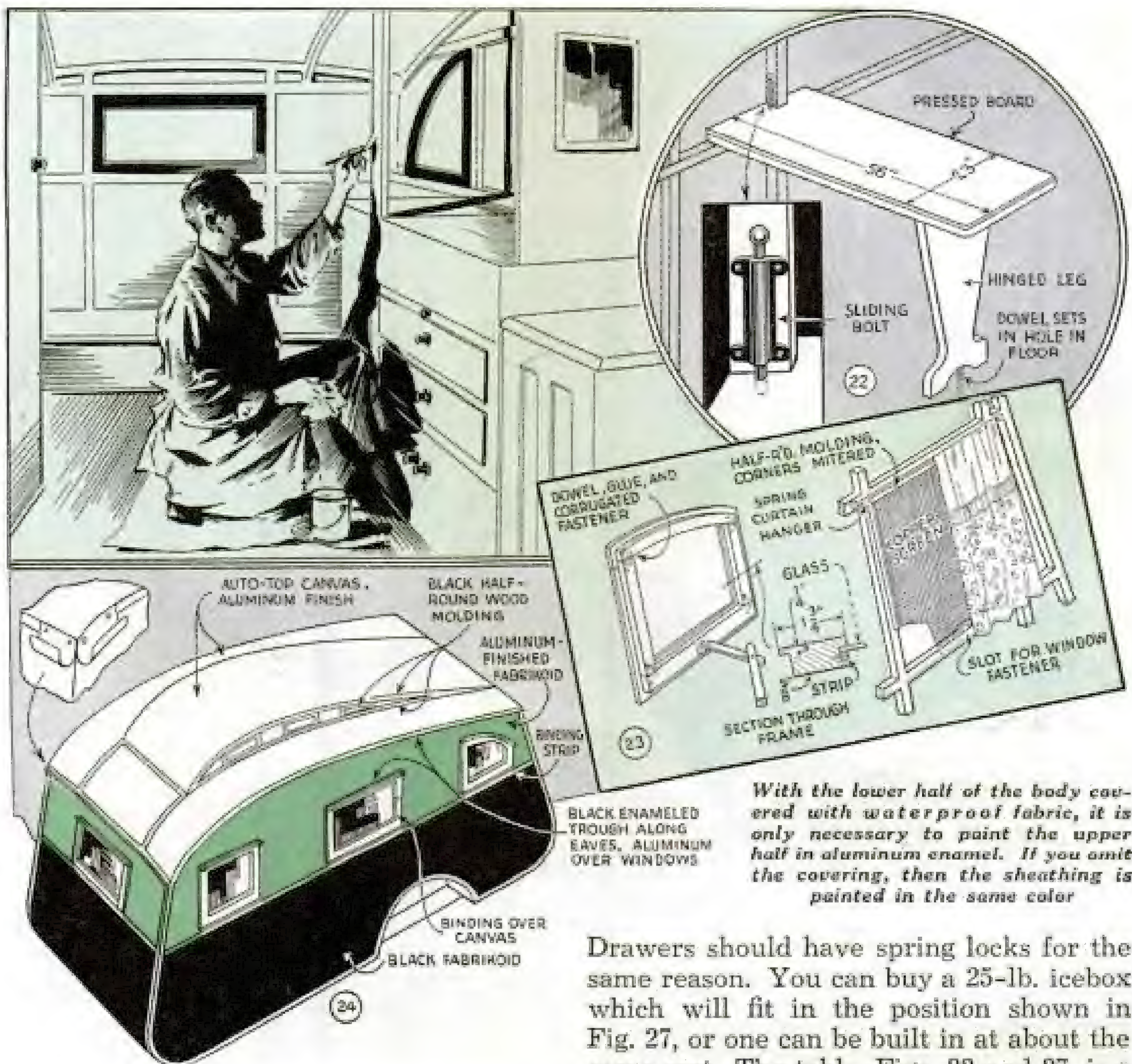
ners joined with casein glue, dowels and corrugated fasteners. The same figure shows how the copper screen is tacked to the inside of the window frame. All windows swing outward on offset hinges as in Figs. 17 and 18. Jointed brackets hold the windows in any position. After you finish the exterior of the body you can permanently install the A-frame and coupling and also the tail and clearance lights.

When you go inside, the first job is painting. An undercoater and two applications of eggshell enamel in ivory or cream should take care of this. Remember that you can easily make a double-walled

job by sheathing the interior walls and ceiling with pressed board or plywood. Now's the time to do this if you desire. The interior walls and ceiling painted, the next job is the floor. A linoleum covering, cemented down, adds to the attractiveness of the interior and is easier to clean.

Now over to Figs. 25, 27 and 28 for the views and plan of the stove, cupboard and sink. Fig. 25 shows a space-saving arrangement of the drainboard. The latter slides down over the sink when not in use, and the swinging arm which supports it when open folds back against the cabinet. The drain pipe from the sink is led down





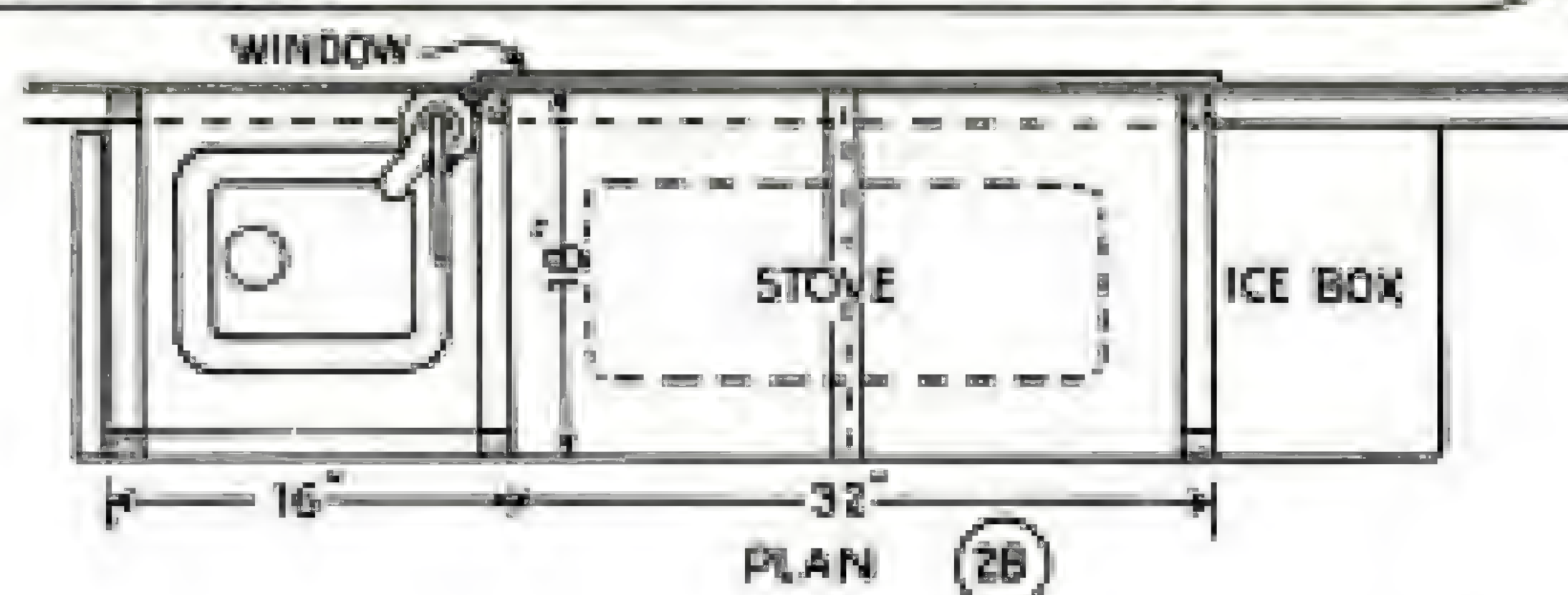
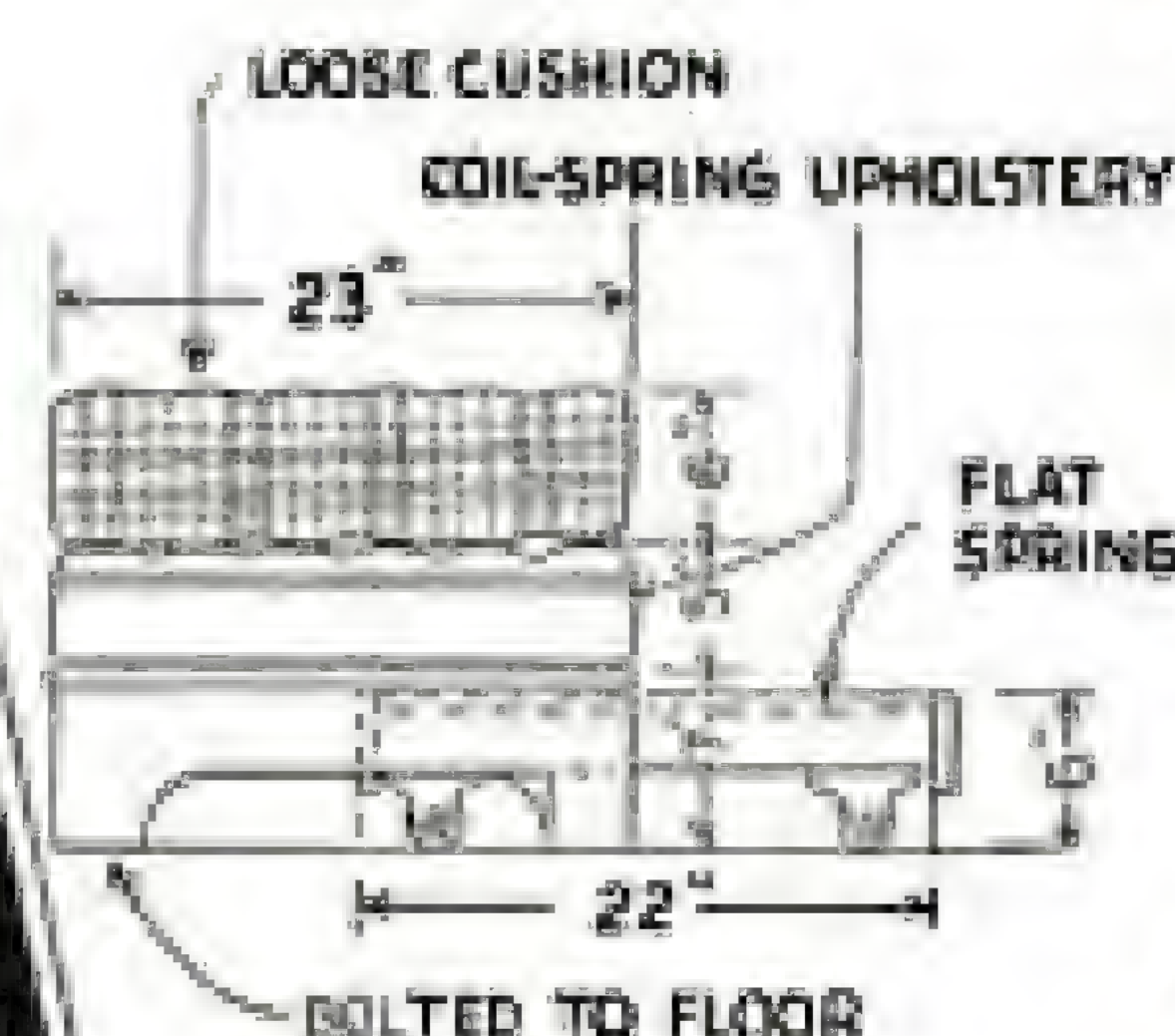
*With the lower half of the body covered with waterproof fabric, it is only necessary to paint the upper half in aluminum enamel. If you omit the covering, then the sheathing is painted in the same color*

through the fender, the end being bent so that the water does not strike the road wheel. The cabinet which houses the cook stove is fitted with two drawers, a sliding shelf, and a cupboard which houses the storage battery with additional room for large utensils. There is more cupboard space above the stove. A 3-in. vent, made as in Fig. 27, passes through this cupboard and the roof to carry off cooking fumes. In the main the framing for this cabinet can be the same material as the body frame,  $1\frac{1}{4}$  by  $1\frac{1}{4}$ -in. spruce. For panels you can use pressed board or plywood. Doors, drawer fronts, and the sliding shelf are best cut from  $\frac{3}{4}$ -in. fir plywood. Fig. 28, with a plan and elevation, shows you where to place the cabinet on the wall. Doors should have positive catches so that they do not swing open on the road.

Drawers should have spring locks for the same reason. You can buy a 25-lb. icebox which will fit in the position shown in Fig. 27, or one can be built in at about the same cost. The table, Figs. 22 and 27, is a simple folding affair made of either plywood or pressed board, painted of course, and is shown open in Fig. 22 and folded against the wall in Fig. 27. Ordinary sliding door bolts are used to hold the table in either position.

Installation of the clothes closet and the chemical toilet as in Figs. 29 and 30 just about completes the job. The elevation, Fig. 29, will give you the size and position of these closets. For material you can use either plywood or pressed board. It will save time to cut the doors from  $\frac{3}{4}$ -in. fir plywood for then there is no frame to make. Notice that there is a flap hinged to the clothes-closet door. This flap hooks to the corner of the stove cabinet, the arrangement forming a partition. All doors should have spring catches to hold them closed. The chemical toilet is vented to the roof through the clothes closet as in



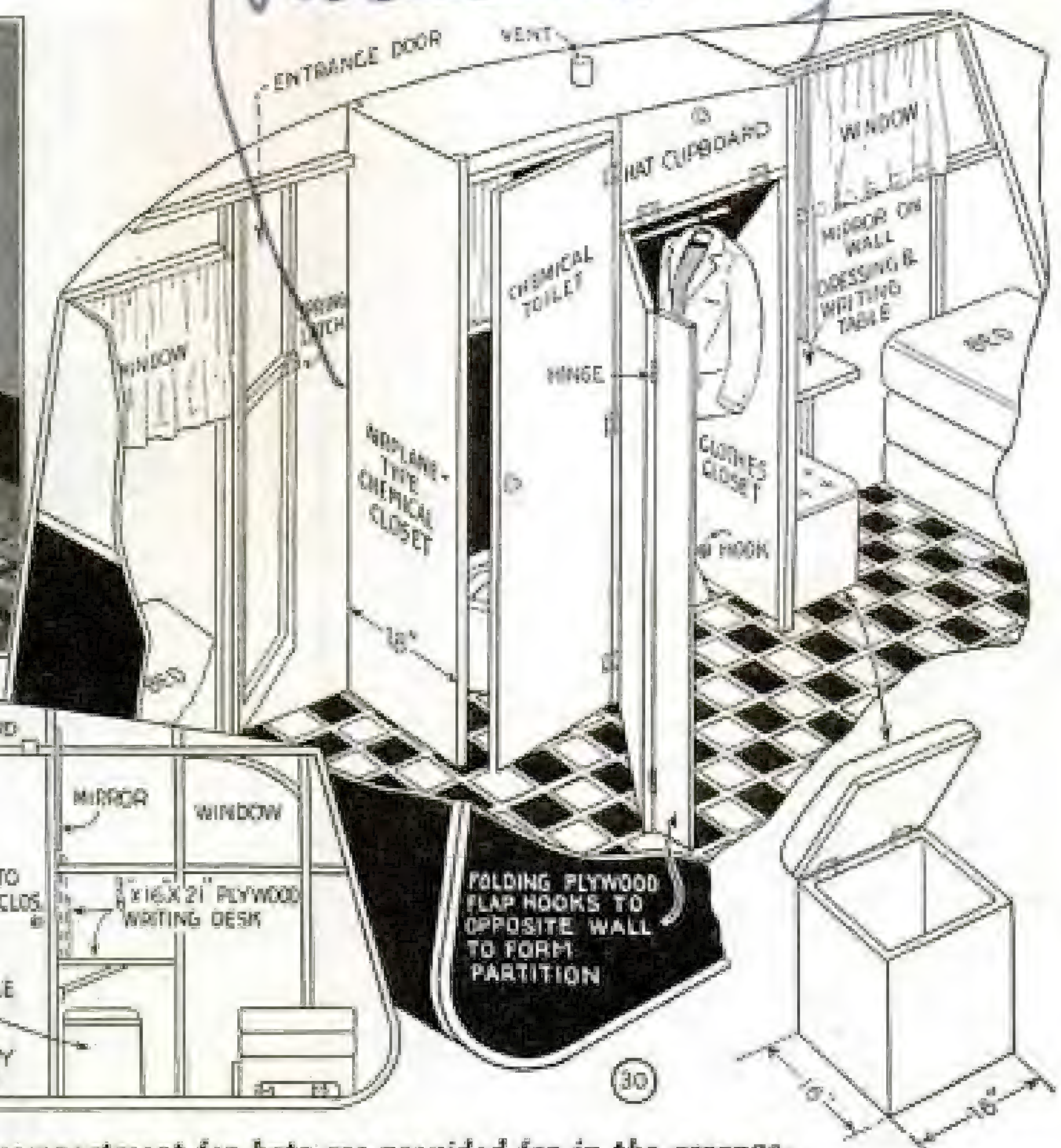
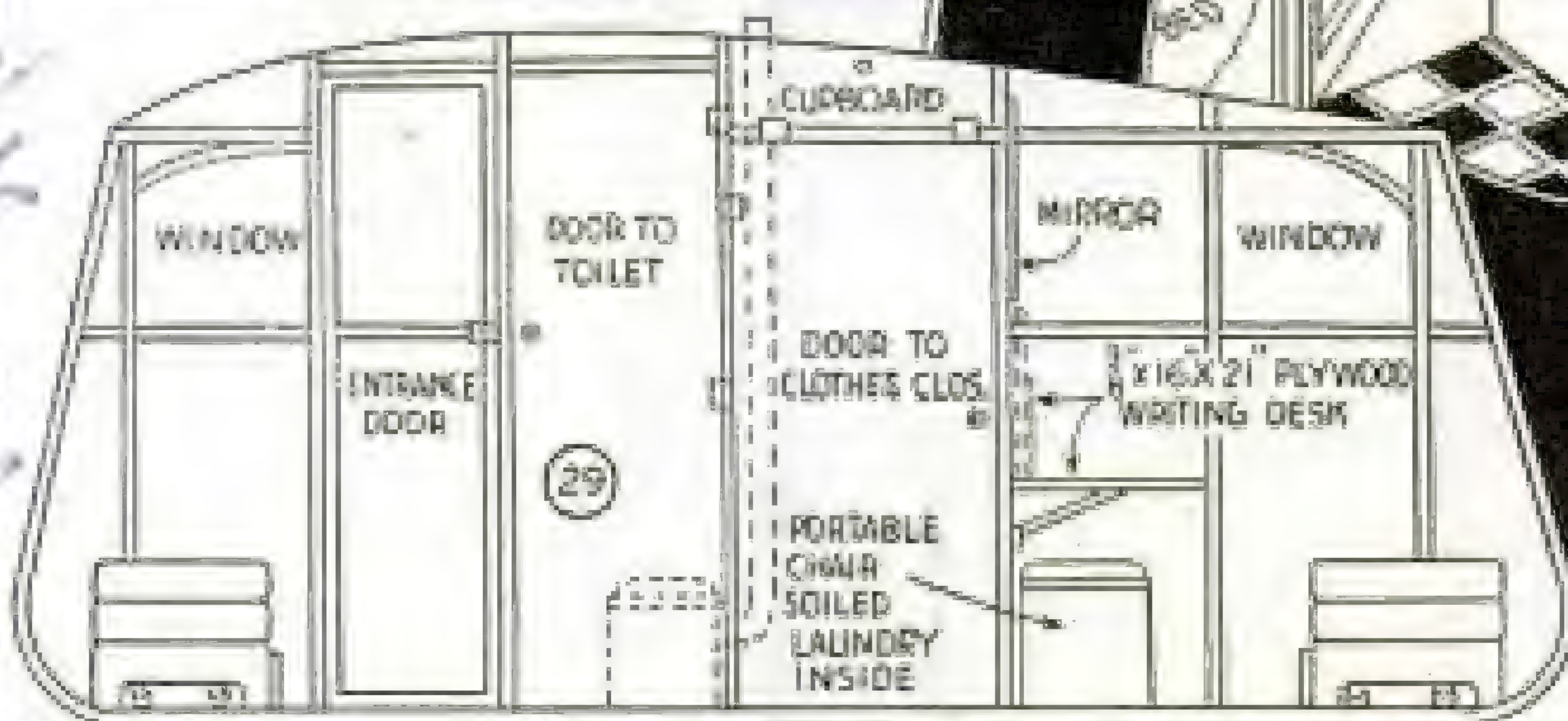


A stool, which is really a box with a hinged top, does duty both as a chair and added storage space. The top may be up-holstered as indicated. The beds are two studio couches, the end dimensions being approximately those shown in Fig. 26. Both can be made up into double beds. When folded there is space in a lower compartment for the bedding. You will save time by buying these ready made, as they are inexpensive. Fasten each to the floor with bolts or screws. Now you come to painting the cabinets, and, if you want a first-class job, give the walls one more

coat. If the doors have been cut from  $\frac{3}{4}$ -in. plywood, as is recommended, it will be necessary to fill the edges of the plywood. A paste wood filler worked into the end grain on all the exposed parts will build up a smooth surface for the paint. Work it into the open grain with a cloth or your fingers, rub off the excess and allow the filler to dry. Then sand the edges lightly with fine sandpaper to level the filler and



*Sierra Sanitary Buggy Co.  
Pasadena, Calif.*



Generous clothes-closet space and a compartment for hats are provided for in the arrangement shown above. There's also a mirror and a folding writing table. A flap on the clothes-closet door hooks to the stove cabinet and partitions the interior into two rooms

smooth up sharp corners. The trick in painting cabinets of this sort is in covering all corners, edges, and the smaller surfaces first, then finish off with the large areas. In this way you can brush out the paint to a uniform coating much more effectively. To produce a smooth, even final coat, it is necessary to be just as particular with the primer as you are with succeeding applications. Another trick is keeping the paint thinned to an easy brushing consistency to avoid a too heavy application which cannot be brushed out to a thin film. This applies also to the exterior paint job. You should be particular with such details as the sliding ventilator panels and the windows. The panels, Figs. 20 and 21, are best removed while you are painting the slides, and the sash should be left open until the paint is thoroughly dry. In this way you will avoid sticking and possible breakage. The same thing is true of the closet and cupboard doors and also the drawers. Now with the painting done, all that remains is to fit and hinge the entrance door and provide a spring lock, and there you are.

## Focusing Cloth Like a Hood Is Useful on Windy Days

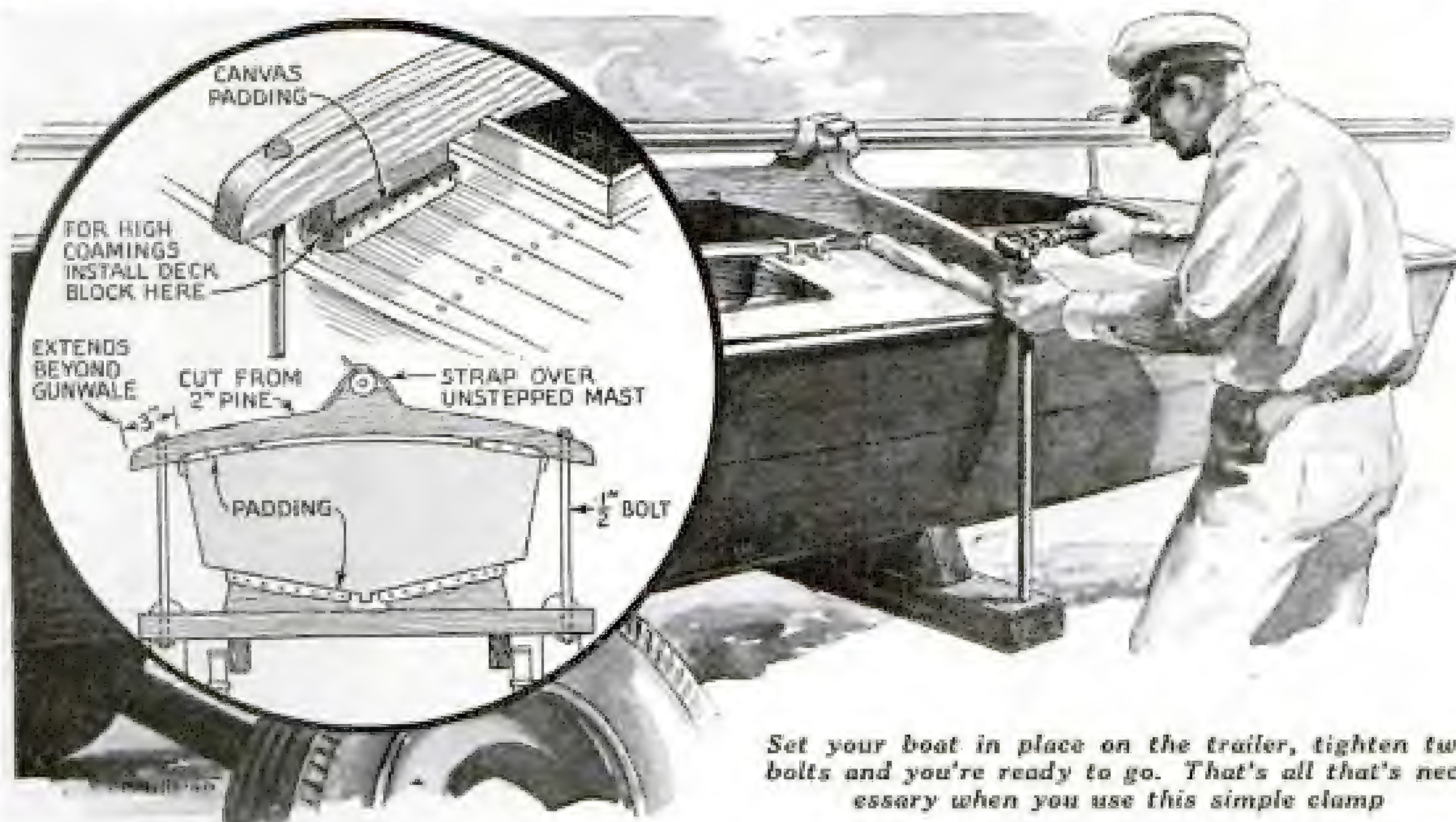
Here is a quick solution to the problem of keeping your camera focusing cloth in position on windy days. Fold the cloth in the middle and sew it about half way down one end to form a hood. The other end is fastened to the camera. In use, the hood is slipped over your head, leaving both hands free to adjust the tripod and focus the camera.



Camera focusing cloth with one end sewed to form a hood is easy to keep in place



## Padded Clamp Locks Boat Rigidly on Trailer



*Set your boat in place on the trailer, tighten two bolts and you're ready to go. That's all that's necessary when you use this simple clamp*

This padded clamp takes care of many difficulties you are apt to encounter when transporting a boat on a trailer. Once it is locked in place the boat cannot shift or slide about to cause chafing or possible damage to the bottom or deck. For craft

over 12 ft. in length, two clamps should be provided, one across the bow and the other just aft of midships. The top bracket is cut to conform to the contour of the deck, being padded at the bearing points. For high coamings provide additional blocking.

## Springless Gate Closer Is Operated by Suspended Weight

Requiring no locks or latches, this gate closer is always ready to do its job as there are no springs to stretch out of shape or moving parts of metal to rust and bind. A weight suspended from a heavy flat-iron arm with a cord or light rope does the trick. Two wood spools serve as rollers over which the cord travels as the arm swings to one side when the gate is opened. The spools rotate freely on a U-shaped rod, the ends of which are driven tightly into holes in the gate post. Besides strengthening the outer ends of the spools, the rod serves as a guide to keep the cord between them. If it is necessary to use a heavy weight, a short piece of hard wire or iron rod should be driven into the post top near the end of the arm as shown, to keep it from scraping on the wood.

☐ Hotbeds should be built and filled very early in the season; a long time before the cold, spring weather has disappeared.





## Wheeled Ash Can Easy to Move About the Basement



*Instead of carrying a heavy ash can to the alley, fit it with rollers and push it*

Screwed to the corners of a square piece of plywood, four rollers of the type shown provide a wheeled base on which heavy ash cans can be moved about with ease. The plywood base is attached to the bottom of the can with long, slender bolts, using washers under the bolt heads to prevent them from pulling through the bottom of the can. If you are in the habit of keeping the can in a damp place for any length of time, the plywood should be painted, impregnated with melted paraffin or given two or three applications of oil.

## Mitten Blotter Saves Time



If you have considerable writing to do which requires constant blotting, such as writing signatures, making entries in books, etc., this mitten blotter will save time. The blotter is made by gluing several thicknesses of

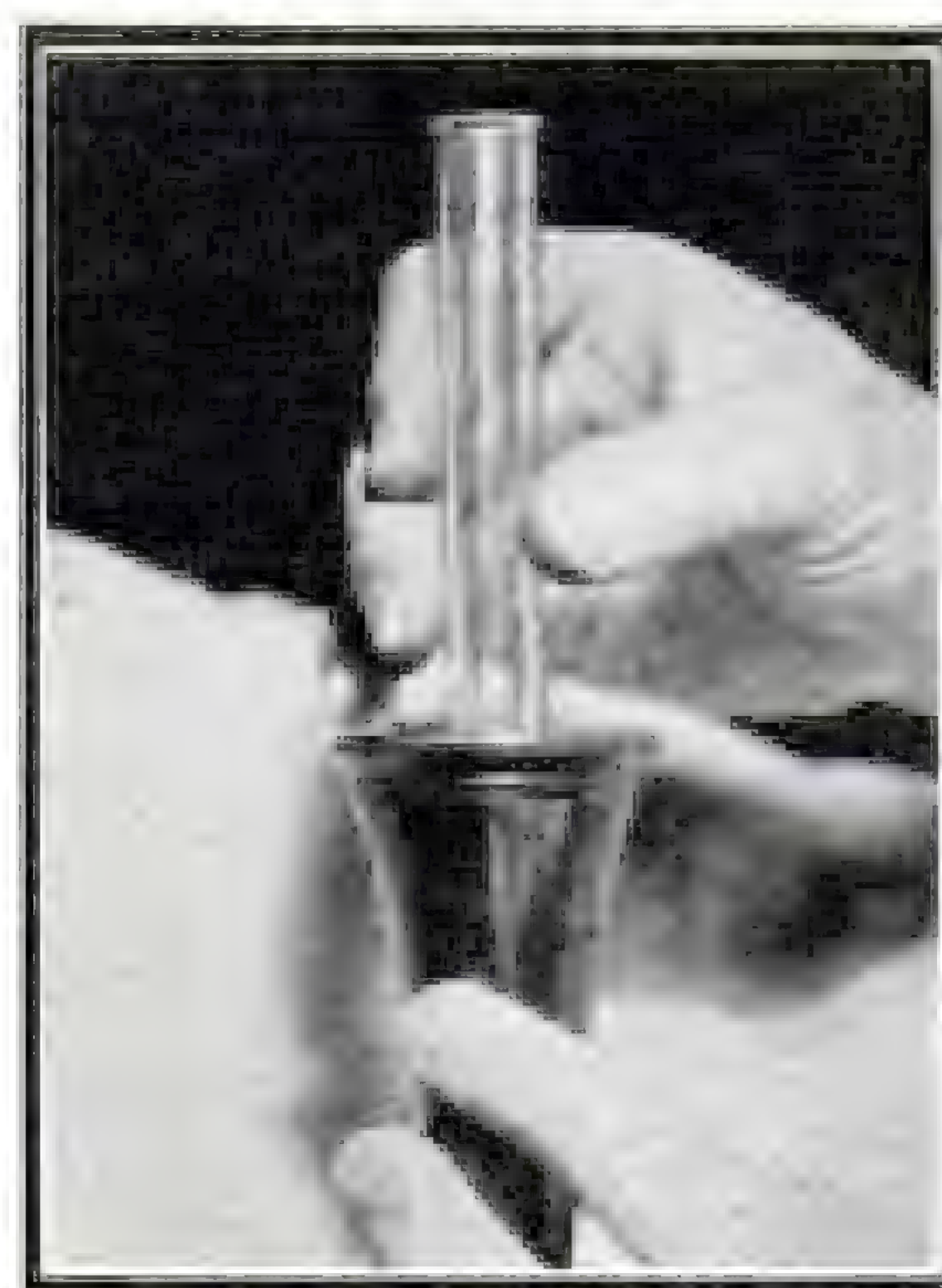
blotting paper to a mitten, gluing the first sheet solidly to the palm of the mitten and only tacking the other sheets to the first one at the corners with a drop of glue. When one sheet is soiled it is removed to expose the next one.

## Photo Printing Frame Is Altered to Take "Vest-Pocket" Films

When making contact prints from a roll of "vest-pocket" negatives, the roll can be handled easily if the bottom of a regular printing frame is slotted to take the film as shown. The slots should come flush with the glass, and their sides and edges should be sanded smooth. In use, the film is slipped through the slots and a piece of printing paper is placed over the negative, after which the back is swung into place and the exposure is made in the usual way. While a black-paper mask can be used to obtain a border on the print, this is usually dispensed with, the print being trimmed after the picture has been dried and is ready for mounting.



## Wood Vases Have Glass Linings



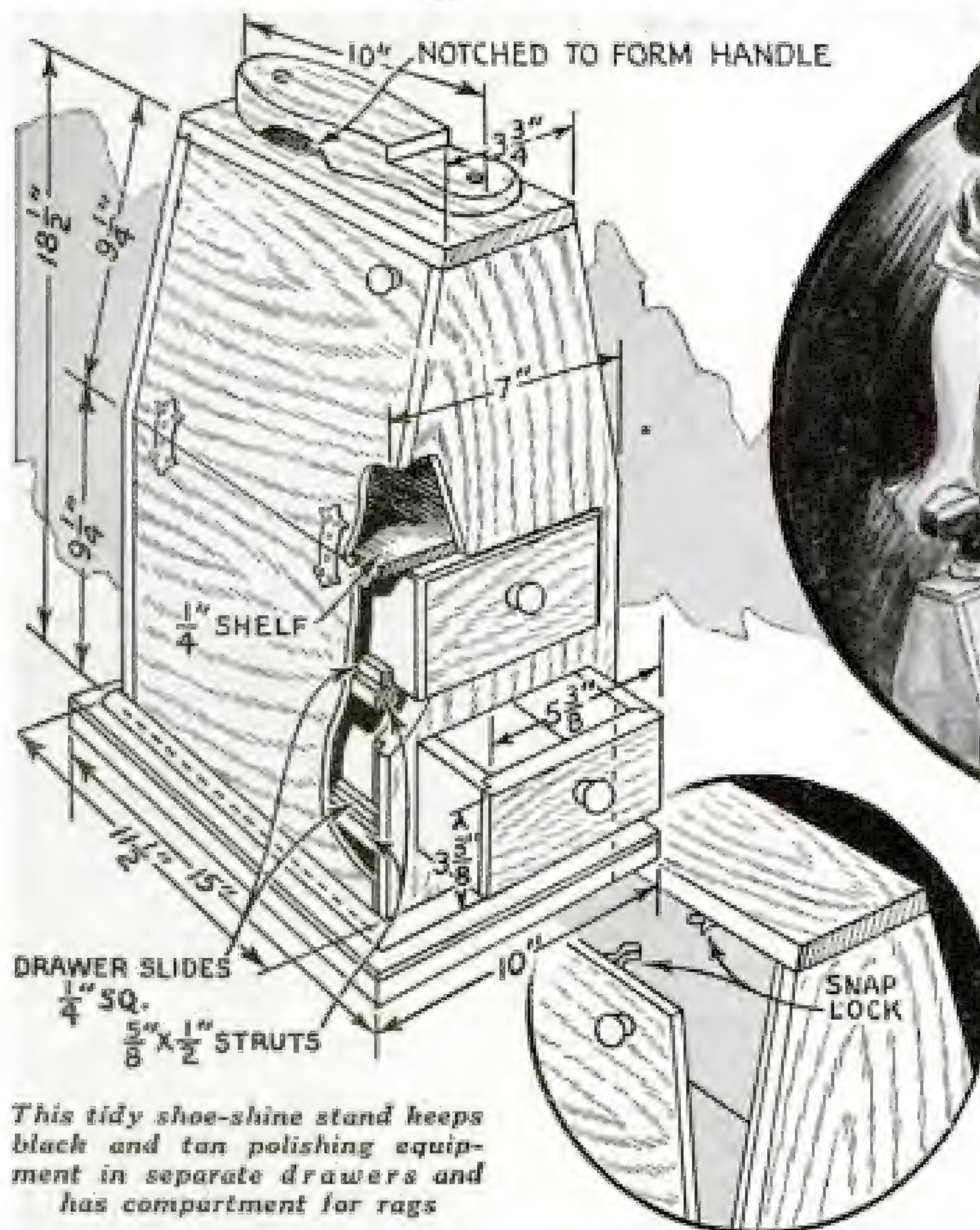
You can use your ornamental wood vases to hold cut flowers in water if glass test tubes are first slipped into the vases. As the tubes can be obtained in various sizes, you will have no trouble in selecting some to suit your

particular needs, taking care, of course, to get them short enough so that they do not project above the tops of the vases.

Ⓐ paper plate glued to the bottom of a paint can, when doing touch-up jobs, prevents paint from dripping on the floor and provides a place to lay the brush.



## Shoe-Shining Stand Stores Brush and Polish



with a hinged side and snap lock for polishing cloths. The shoe rest, which is screwed to the top of the stand, is notched to serve as a handle to carry the stand. The base and ends are 1-in. stock, the sides 1/4-in. stock, and the top 5/8-in. stock. Note that the finger

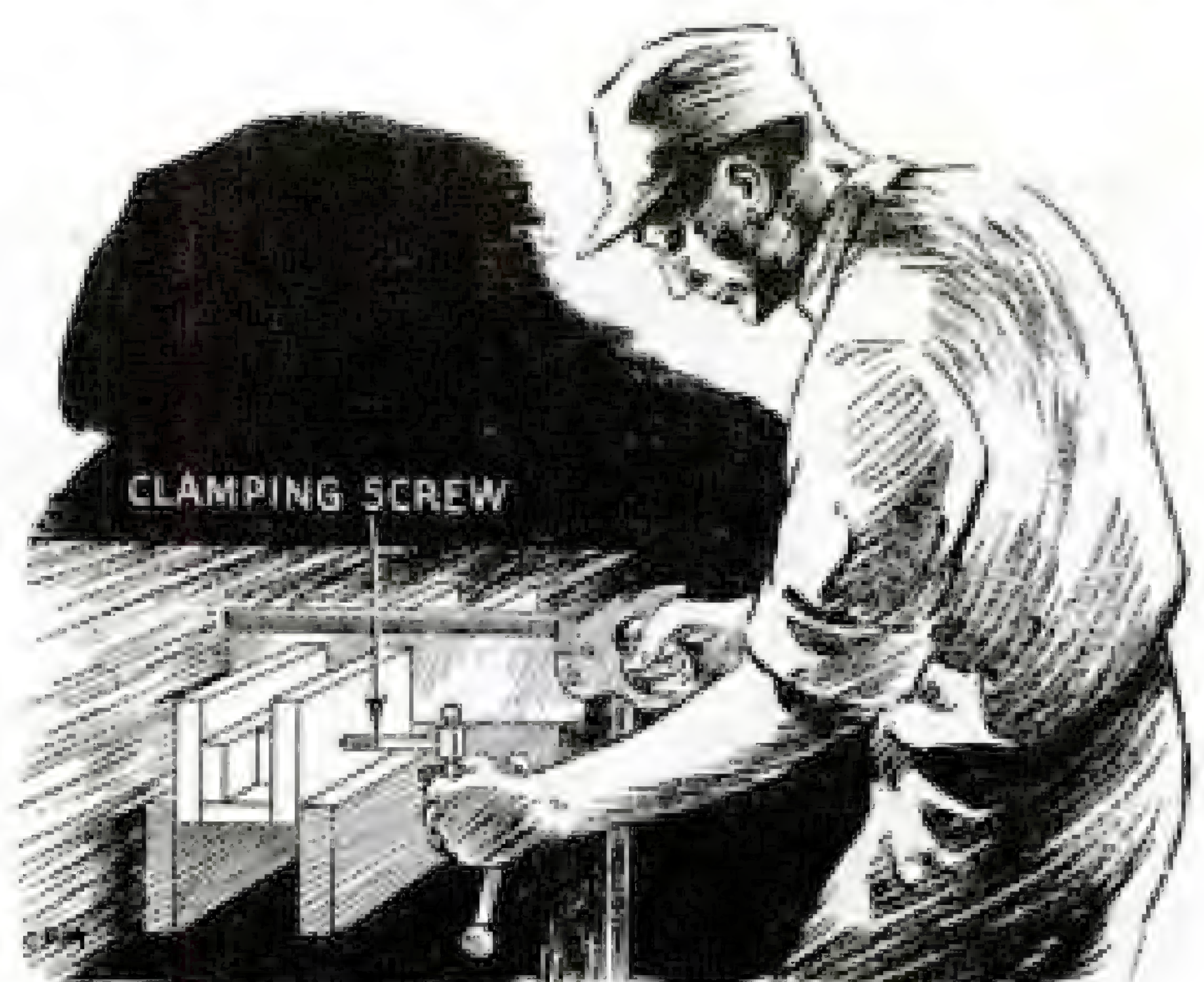
Why not help to keep the home tidy by providing a convenient shoe-shine stand, where polishing materials are neatly stored and always ready for use? This one has two drawers for storing brushes, polishes and cleaners as well as a compartment

knob for opening the cloth compartment is placed to one side so that it will not interfere with hand motion when shining the shoes. The stand takes little space in a closet or other storing place. — Charles Brothers Anthony, Kalamazoo, Mich.

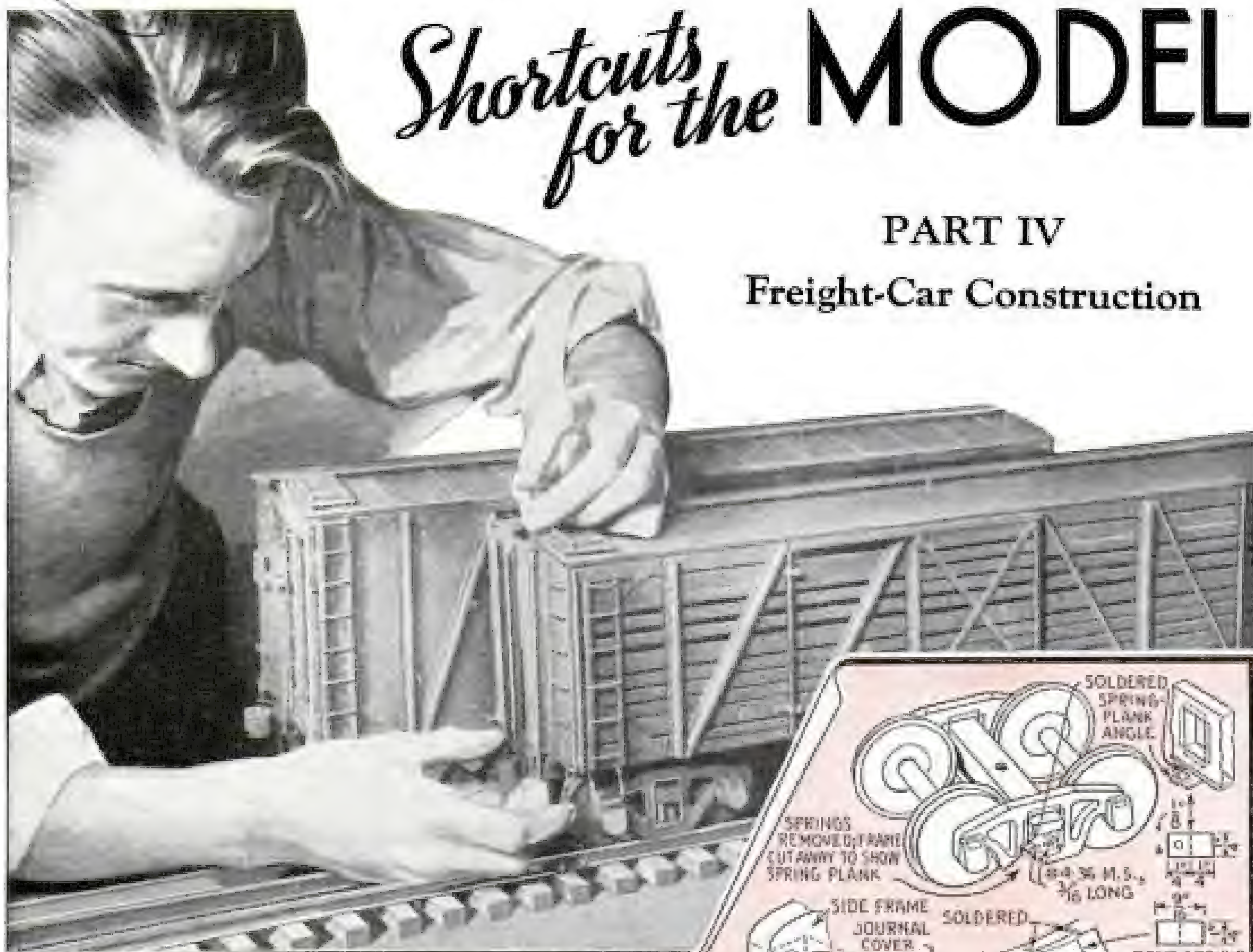
## Miter-Box Clamp Grips Work to Relieve Strain on Hand

When mitering, I find this clamp helpful to hold work rigidly in the miter box. The clamp is a lag screw with the threaded end cut off square and a pin driven through a hole in the head to serve as a handle. A piece of scrap wood between the end of the screw and the work prevents marring the latter when the screw is tightened against it.—D. W. Prince, Quincy, Mass.

☐Holes and indentations in linoleums are repaired easily by filling them with a mixture of finely chopped cork and liquid glue, which is smoothed carefully and given two coats of clear varnish when dry.



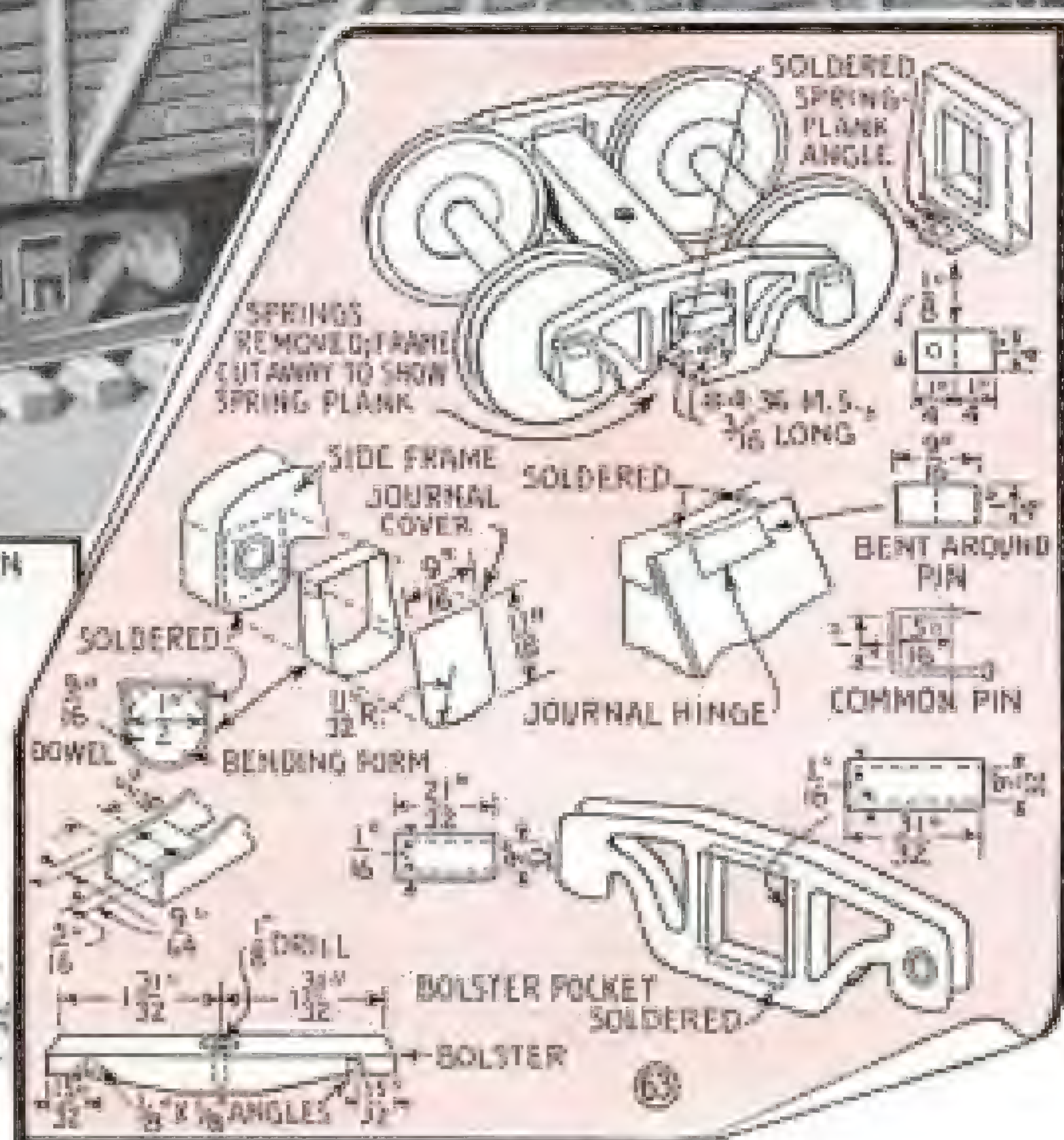
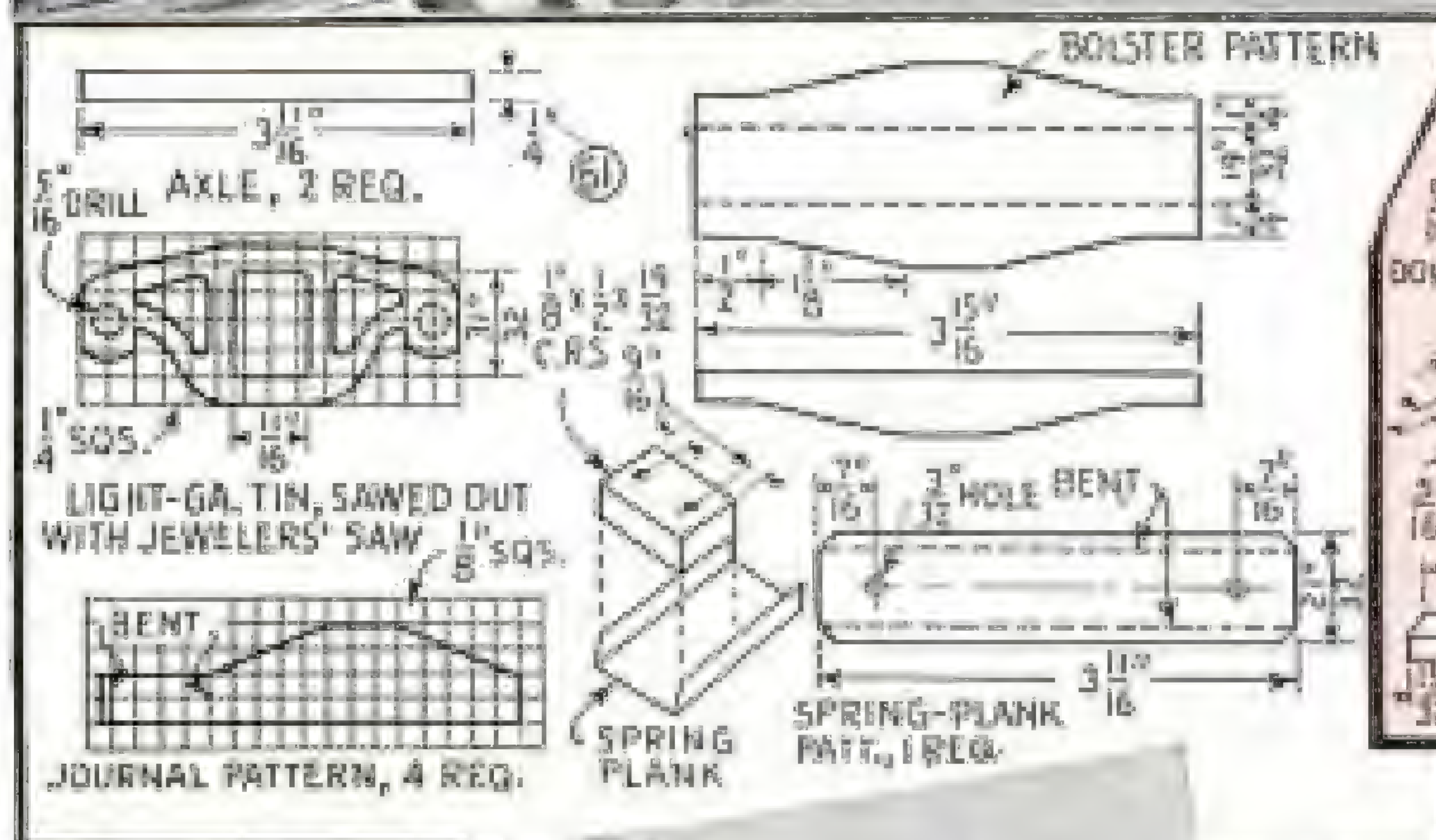




# Shortcuts for the MODEL

## PART IV

### Freight-Car Construction



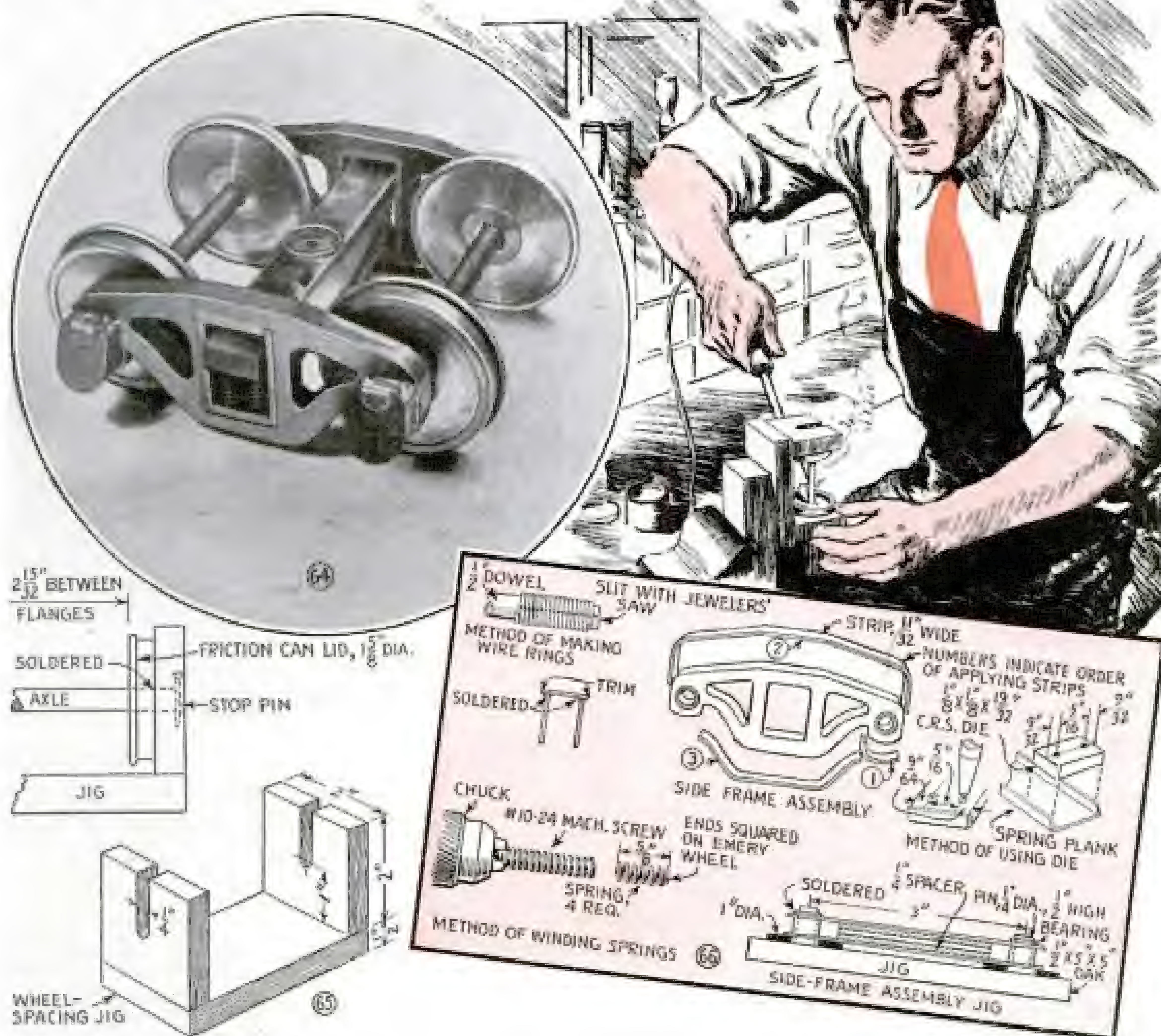
WHEN you build the cars for your model railway system you can use essentially the same materials as were used in the construction of the locomotive. Figs 61 to 66 inclusive show the assembly of a freight-car truck using friction can lids for wheels and odds and ends of sheet

metal for the frame. Fig. 64 shows you the result. Information on wheel construction will be found in a previous issue of Popular Mechanics. Figs. 61, 62, 63 and 66 show the details on the truck frame. All parts are shown in  $\frac{1}{2}$ -in. scale, but this is easily reduced to  $\frac{1}{4}$ -in., the smaller size permitting use of essentially the same methods. The truck frames can be made of sheet brass instead of tin, or, if your blueprints call for  $\frac{1}{4}$ -in. scale, then the use of solid brass will save time as you can make the side frame in one piece.

You start the job by cutting parts to the pattern sizes shown in Fig. 61 and assemble the side frames on a jig as in Fig. 66. Use your drill press to wind the bolster



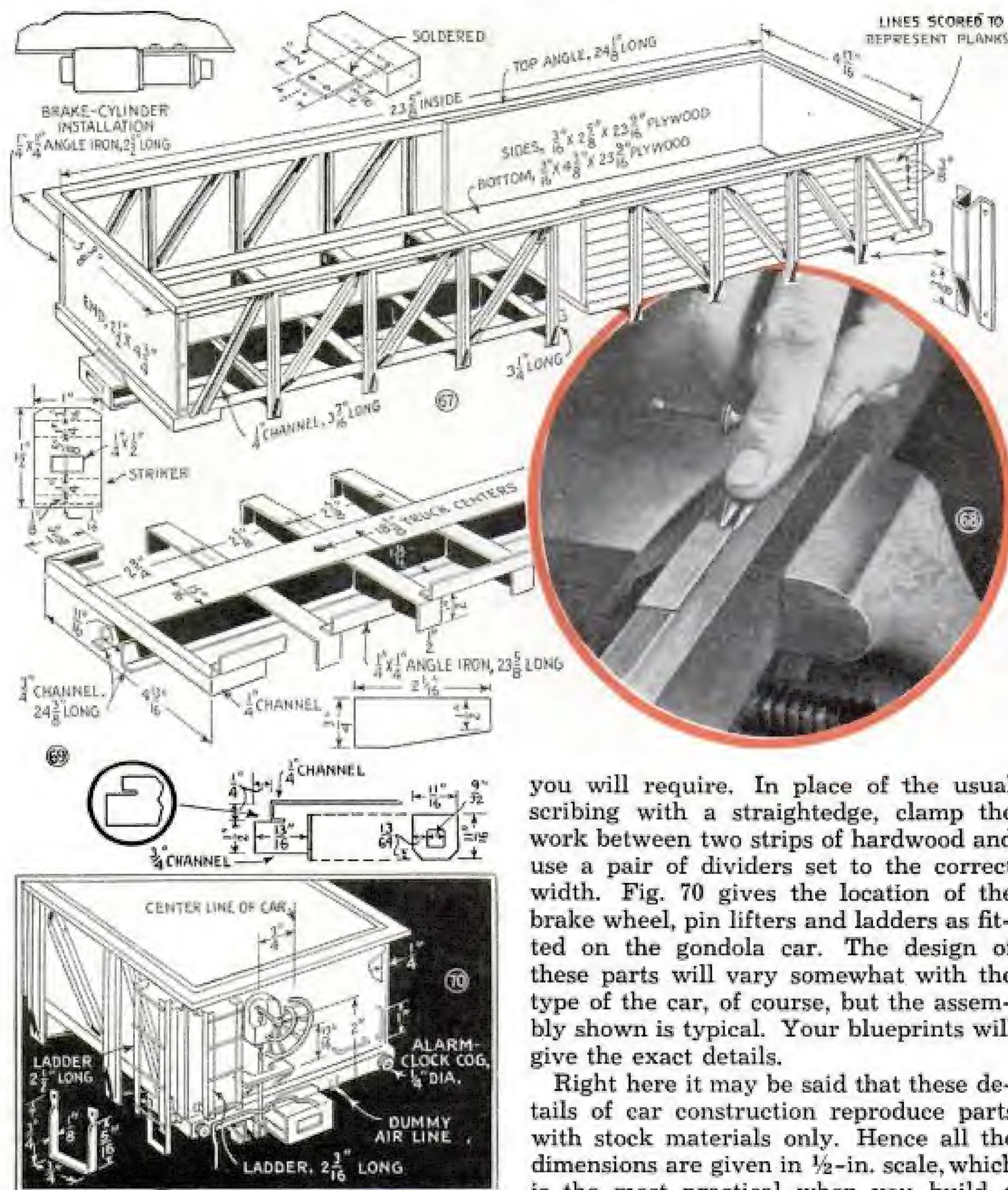
# RAILWAY BUILDER



springs. Then assemble the wheels on the axles with a jig made as in Fig. 65, soldering the wheels in place as in the illustration at the upper right. The journals are simply dummies bent to shape on a hardwood former as in Fig. 62 and soldered to the frame. The cover is hinged as in Fig. 63. Note especially that a number of the parts must be duplicated. To do this quickly stack the sheet metal in the same number of thicknesses as there are parts required, and lay off the pattern on the top sheet. Then clamp the sheets together and saw through the whole thing. This will give you duplicate parts in one operation. Drilling for the bushings can be done in the same way.

The car frames come next. These differ, of course, with the type of car you are building, but Fig. 69 shows a typical car-frame construction. It is a built-up affair made entirely of stock sizes of sheet metal, channels and flats, and designed for a gondola body as in Fig. 67. With exception of the bottom and sides which are of plywood, scored to simulate planking, the gondola frame is purely a sheet-metal job. Note that when assembled the uprights are joined directly to the underframe, making a single unit. Before you attempt to assemble a job like this take time to clean thoroughly all parts to be joined, and once you have the parts clean, avoid handling them wherever possible. This





you will require. In place of the usual scribing with a straightedge, clamp the work between two strips of hardwood and use a pair of dividers set to the correct width. Fig. 70 gives the location of the brake wheel, pin lifters and ladders as fitted on the gondola car. The design of these parts will vary somewhat with the type of the car, of course, but the assembly shown is typical. Your blueprints will give the exact details.

Right here it may be said that these details of car construction reproduce parts with stock materials only. Hence all the dimensions are given in  $\frac{1}{2}$ -in. scale, which is the most practical when you build a scale reproduction of any particular prototype. When the scale is reduced to  $\frac{1}{4}$  in., you can often save time and effort by omitting certain small details and purchasing some of the parts ready made.

Beginning with Fig. 71 and continuing to Fig. 74 you have the essentials of box-car construction. You will see at once that in general assembly of frame and body the car shown is practically a duplicate of the gondola. Fig. 72 shows the body of the car mounted on the underframe and ready

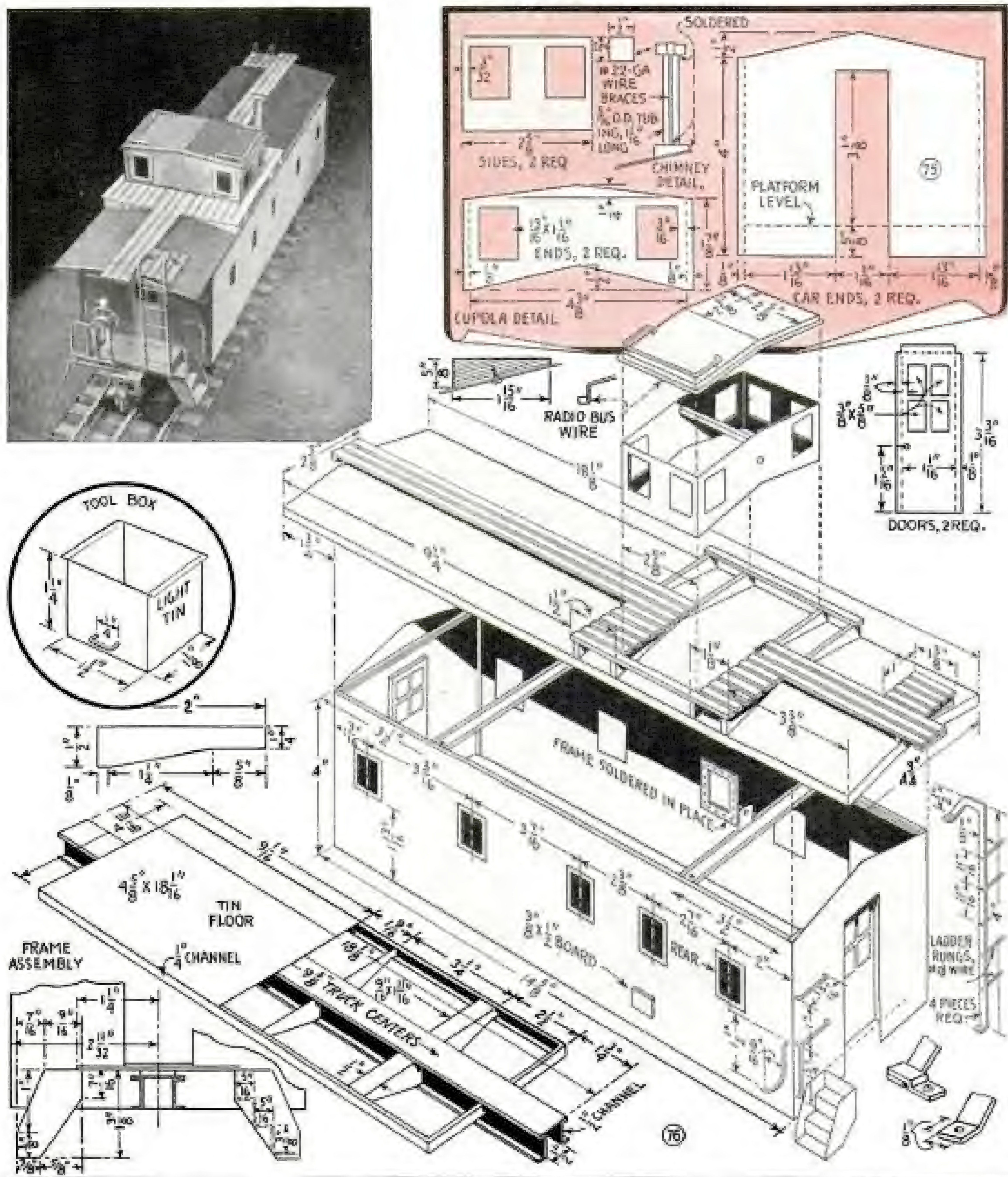
precaution will save trouble in soldering. Spring clothespins make the handiest clamps for the assembly work, for with these it is a simple trick to hold the parts in position for soldering.

Some gondola and car frames will call for rivet impressions in the metal parts. These you can make with the impression die described in a previous issue of Popular Mechanics. Fig. 68 shows a simple trick in laying off the exact width of the angles







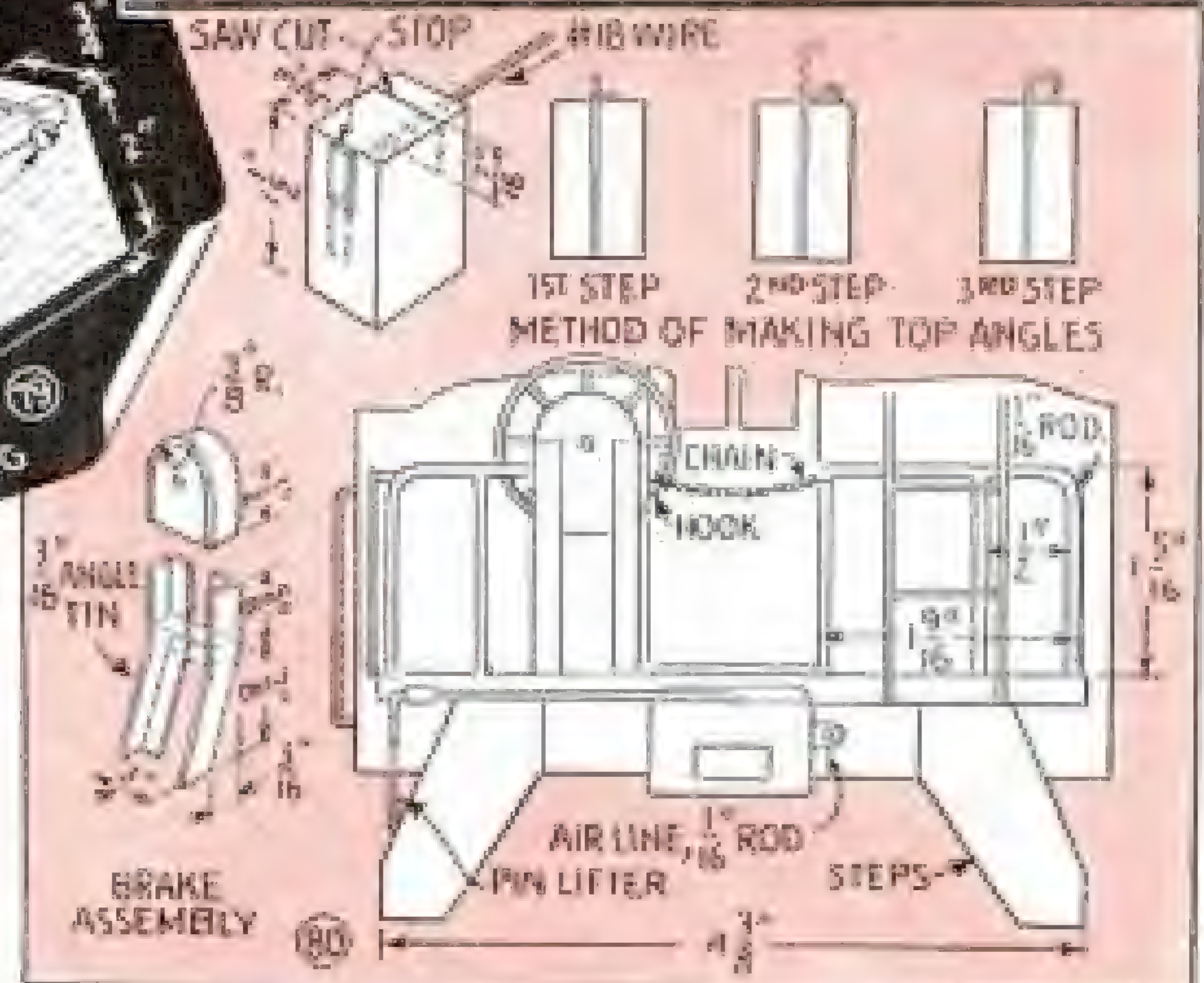
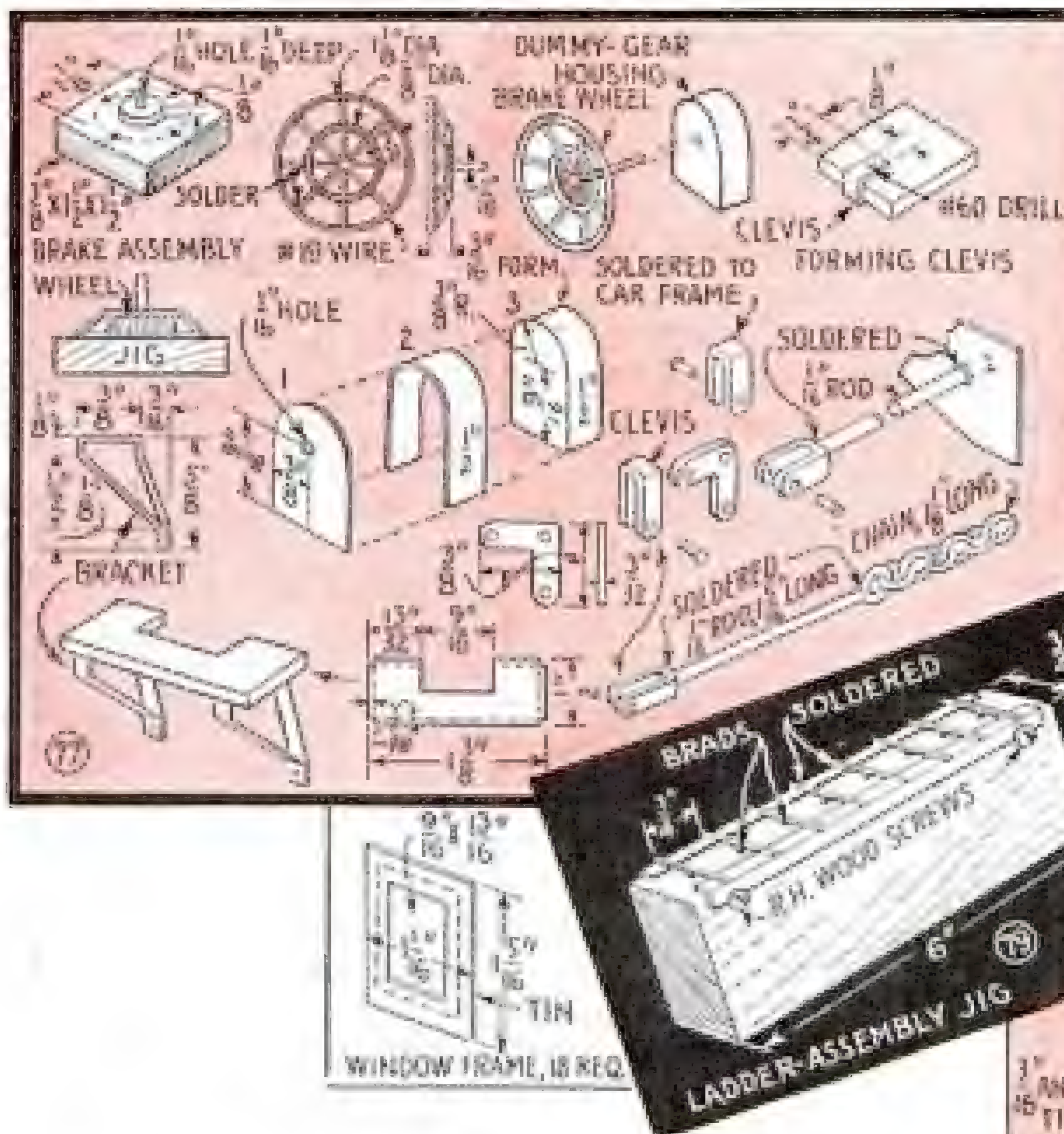


omits all cross bearers save those directly over the truck bolsters. Likewise the frame for the refrigerator car will show some variation from the stock or box car, though the frames for the latter two cars are generally the same.

Now the caboose. This is a somewhat more elaborate affair as shown in the details beginning with Fig. 75. It is constructed entirely of sheet metal except the roof boards which are of thin wood. Note from Fig. 76 that the frame is the same

construction as that of the box and gondola cars except that the central beam extends beyond the cross bearers at each end. Fig. 76 also shows the body assembly with all parts dimensioned in 1/2-in. scale. The job begins with the frame, which as shown is made up of sheet metal as is the boxcar frame. If you wish to make up this same frame in 1/4-in. scale you can save time by using solid brass, cutting this to the sizes and shapes required. With the frame made up you next cut out the sides





with a pattern, the latter including the window openings. Then cut the ends in the same way, stacking the metal in each instance and cutting through both thicknesses so that you get duplicate parts. Assemble sides and ends as in Fig. 78, clean the joints at the corners and smooth the edges with a file ready for the top. The latter is one piece of sheet metal, there being no opening cut for the cupola. The windowpanes are squares of transparent celluloid fastened over the openings with celluloid cement. Parts for the cupola are shown in Fig. 75 and it is assembled in the same way as the body of the caboose. The balance of the details in Figs. 75 and 76 complete the main structure, which is then soldered to the underframe.

Now for some general details which apply to all car types and the caboose. Fig. 77 shows the manner of making up the brake-wheel assembly for the cars while a further detail on the brake-wheel assembly for the caboose is shown in Fig. 80. In Fig. 79 you have a handy hardwood jig for making the ladders, and in Fig. 80 a jig which makes easy work of cutting ladder rungs to exact length. Fig. 80 also details simple hardwood jigs for making up angles from flat sheets. The method of making up windows and frames, like those on the caboose, is shown in Fig. 79.

The paint job on the cars should reproduce as nearly as possible the colors of

the prototype. Wherever you have wood to paint, such as on the cattle and box cars and the wooden gondola, make sure that you have a smooth surface before paint is applied. On the larger areas you can use fine sandpaper, but in close quarters a small bunch of fine steel wool pressed into the end of a short length of tubing is much better. Clean all the soldered joints with steel wool and round over sharp metal corners with a file. Where possible, it's best to disassemble parts for painting. A flat iron paint gives the best appearance on all metal parts of the cars. Use an oil paint on the wood. Carefully applied, one coat of the flat paint will be sufficient on metal, but the wood should have at least two coats, a primer and a finish coat. The one important thing in painting a model is to keep the paint solution thinned so that it brushes easily without any tendency to drag under the small brushes. Get in the close corners and over the small areas first, leaving the larger surfaces till the last. Watch that the paint film doesn't sag. Keep the excess picked up with vertical strokes of the brush.

(To be continued)



## Hand Mirror Supported on Table in Altered Coat Hanger



*This holder leaves both hands free when shaving or dressing in front of a small mirror*

When you find it difficult to keep a hand mirror propped up vertically on a table, just bend a wire coat hanger to serve as a support. The wire of the hanger is soft and is easily bent with a pair of pliers, altering the design shown to suit your particular mirror.

## Glass 'Feeding Pen' in Aquarium Floats on Surface

By using this floating pen, you not only effect a saving in food by keeping it confined, but you prevent small particles from



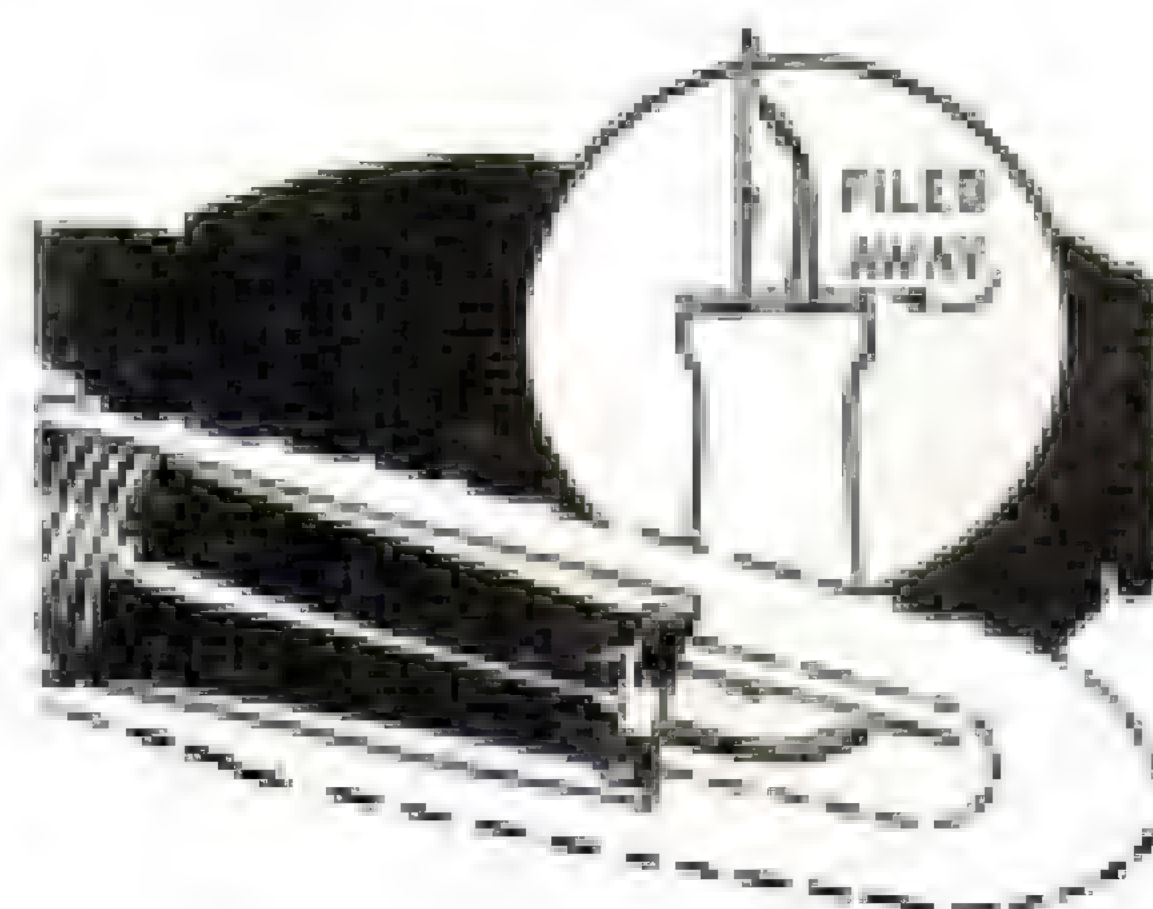
adhering to the sides of the aquarium where they decay, contaminating the water and providing a breeding place for parasites. The pen is made from a 1-ft. length of glass tubing, which is sealed at the ends and bent to the shape shown.

To seal the tubing, heat the glass about 1 in. from each end, slowly drawing it out

as it softens. After this, heat the tubing at the proper spots and bend it to shape.—K. F. Keith, St. Petersburg, Fla.

## Renewing Grip of Pen Cap

Threads on my favorite fountain pen wore down until the pen dropped from the cap and allowed ink to spot my vest pocket. To remedy this trouble I filed off the end of the pen so it would go a trifle farther into the cap before striking the shoulder. This permits the threads to get a firm grip and now the cap holds as well as ever.—H. E. Benson, Denver, Colo.



## Ferrotypes Are Polished to Remove Scratches

Scratched surfaces of enameled ferrotypes plates can be restored to practically a new condition by means of an automobile polish which is slightly abrasive, such as is used for removing traffic grime from lacquered surfaces. Directions supplied with the polish should be followed. Generally, these recommend rubbing the surface with straight back-and-forth movements, followed by polishing to a high

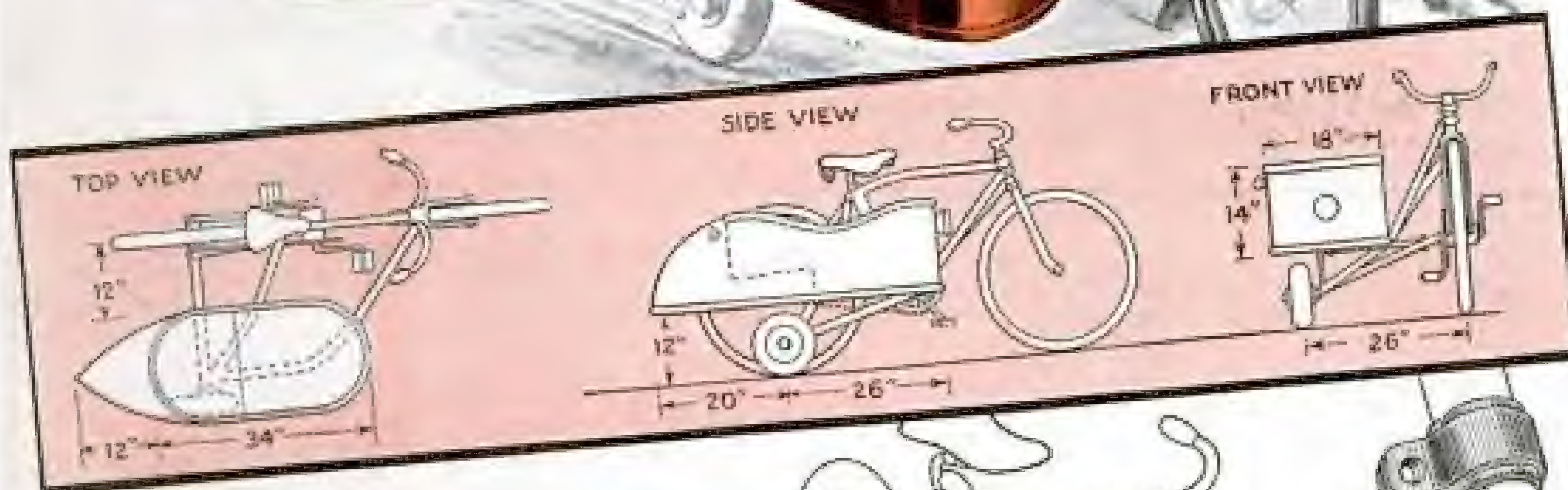


*Rubbing enameled ferrotypes plate with auto polish removes fine scratches in the surface*

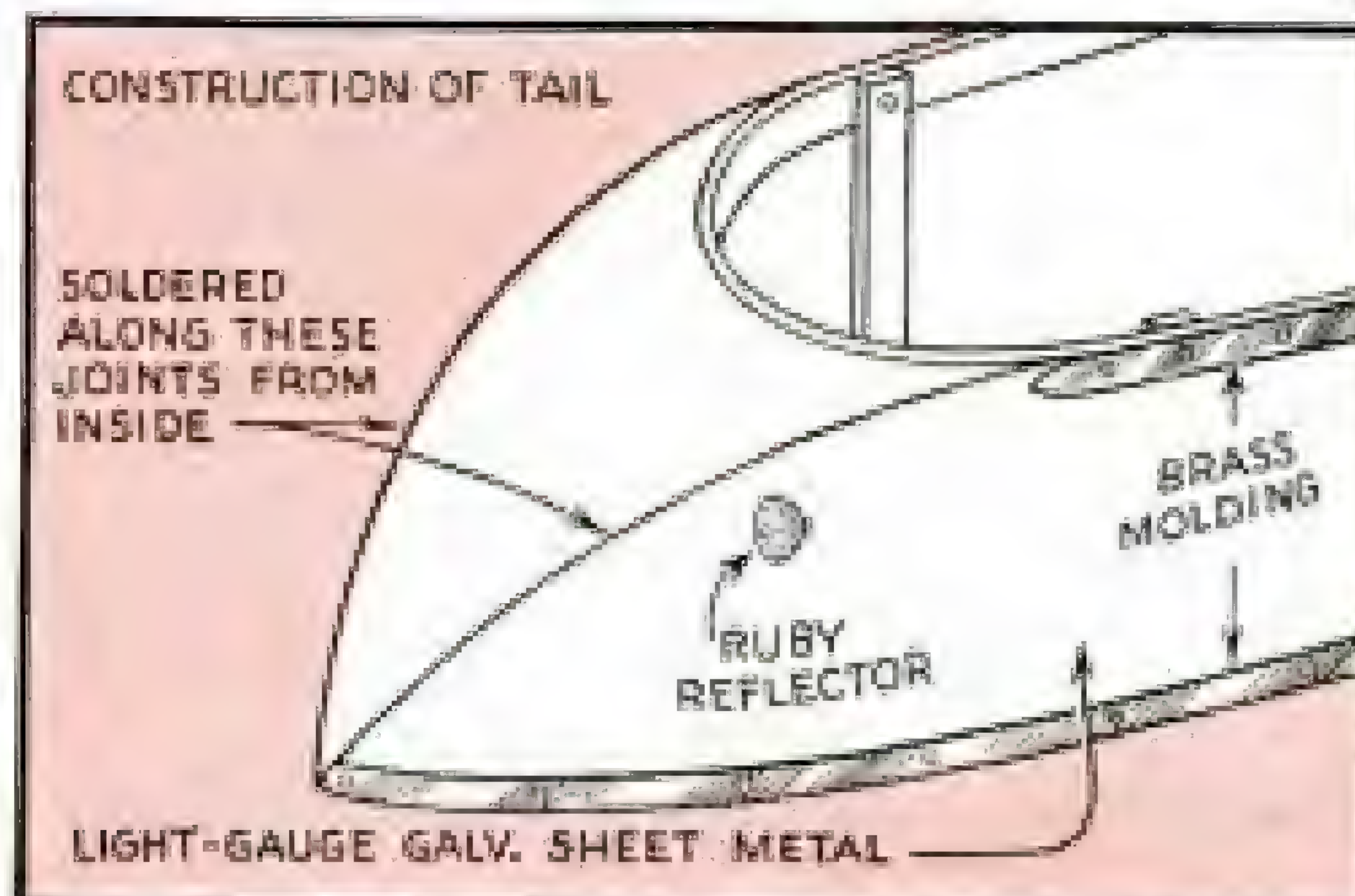
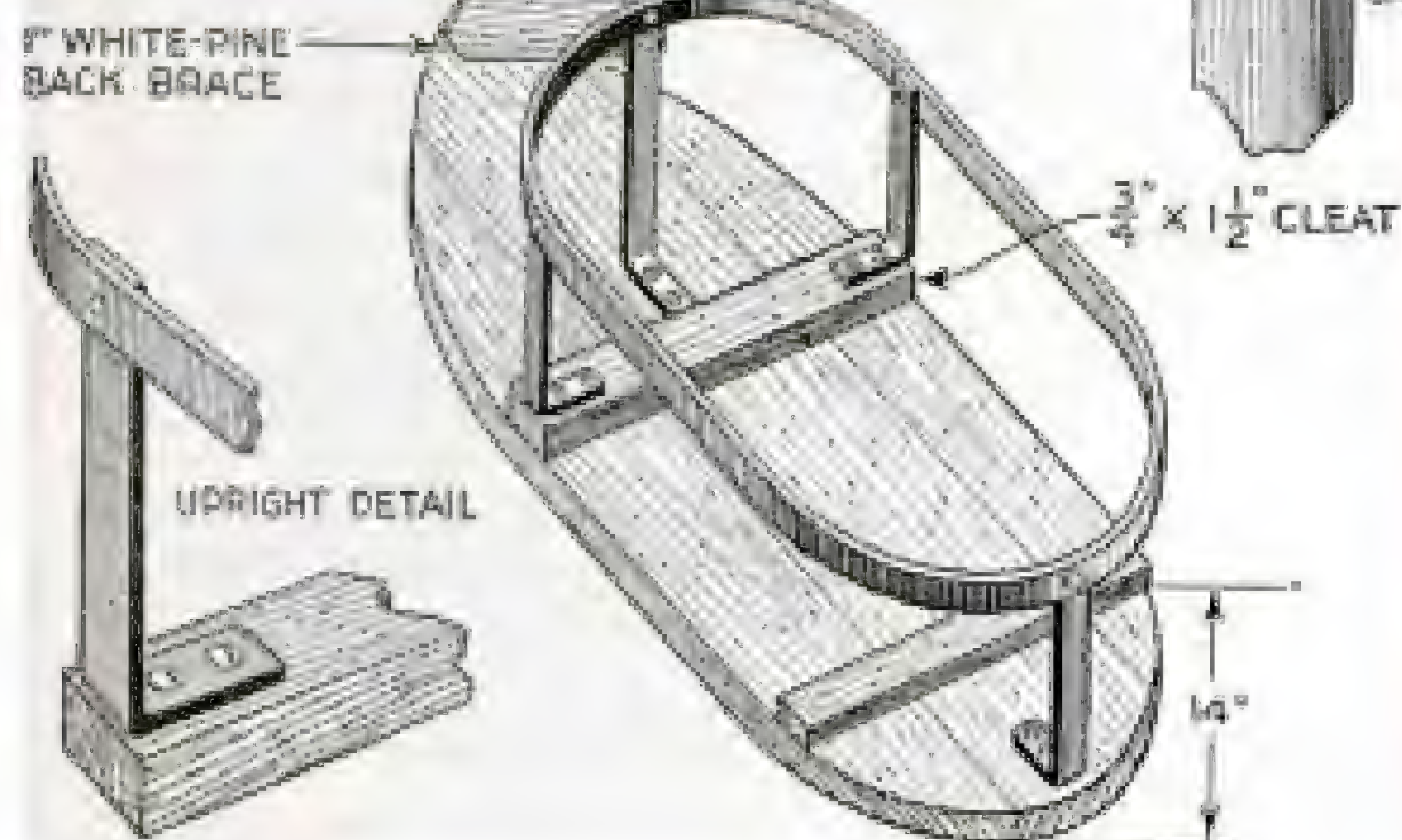
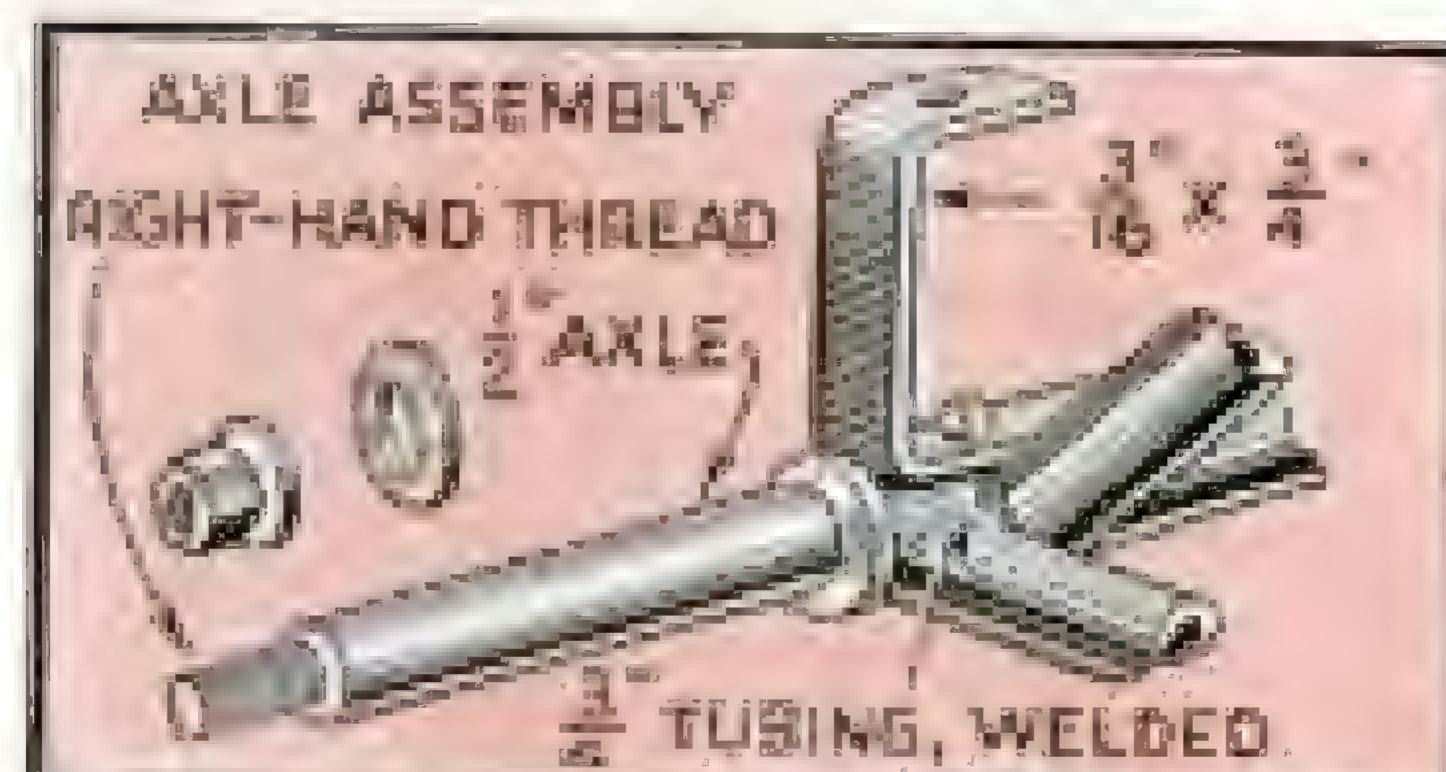
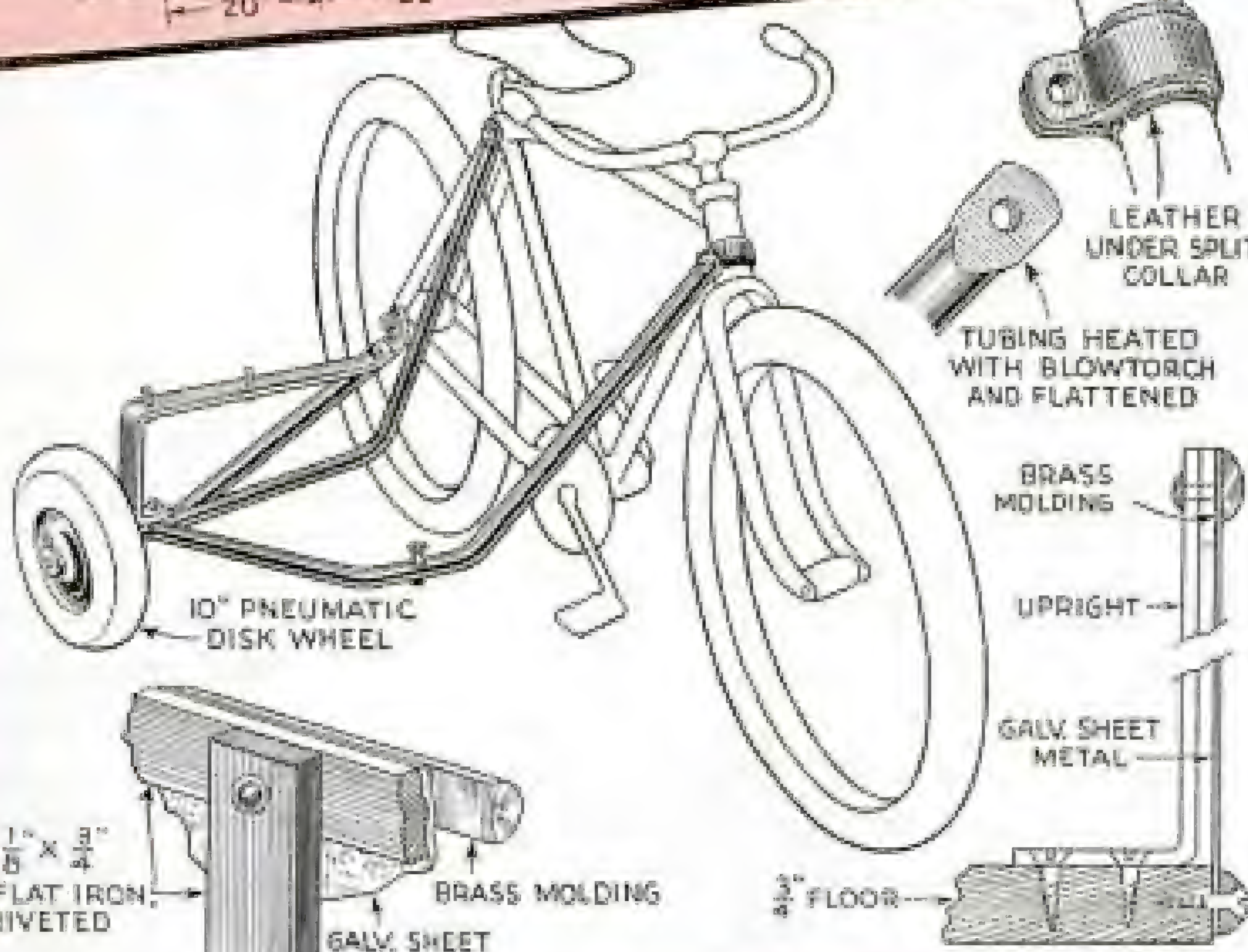
gloss with a soft cloth. After the surface scratches have been removed, a thin coating of wax should be applied to the plates before using them.



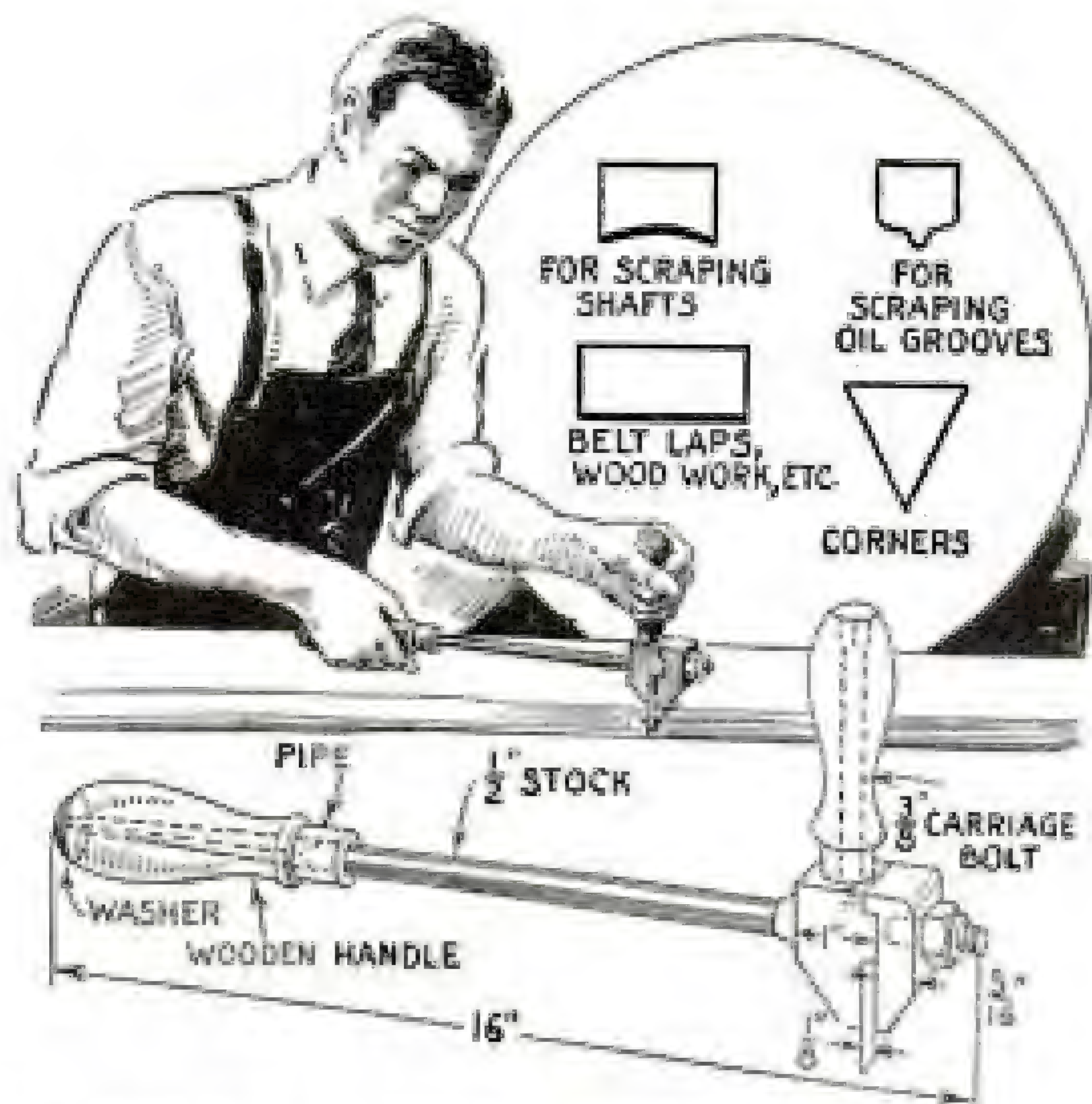
# Bicycle Sidecar



*Your friends will enjoy a ride in this sidecar, and it's just the thing for delivering parcels, newspapers, etc. The tubing is heated with a blowtorch to facilitate bending, and the welding is a simple job for the neighborhood garageman.*







Handles for both hands permit free, sweeping strokes and careful guiding of the scraper.

## Scraper Has Removable Blades for Variety of Work

For almost any scraping job from belt laps to oil grooves, whether the surfaces to be scraped are convex, concave, or are grooved, you will find this scraper, which has adjustable jaws to hold cutters of various shapes and sizes, a handy addition to your workshop. The cutters are best ground from tool steel such as old planer knives, wood scrapers, etc. For heavy work, the jaws should be casehardened.

When rubber-finished raincoats become hard, it is claimed that flexibility can be restored often by brushing them with a solution consisting of equal parts of ammonia and water, keeping the coat wet with the solution for several hours.

## A Masterpiece in Ship Models



Hundreds of plans for many other projects are listed in our 80-pp. booklet "What to Make" which will be sent for 12c postpaid. Also contains information on workbench construction, tools you need, how to file saws, make wood joints, spin metal, get correct measurements, etc.

Do you want a model of one of the most outstanding warships in history? If so, build the "Sovereign of the Seas." Complete information on the construction of this ornately decorated, and highly picturesque model, 34 in. long and 26 in. high over all, is given in our blueprints 828 to 835 incl., priced at \$1.50 per set. Descriptive text in bound book, \$1.00 additional.

### OTHER WORTH-WHILE MODELS

"Flying Cloud" Clipper Ship—709-714A: No collection is complete without a clipper. Complete with full-size lift templates—\$1.25.

"Half Moon"—717-718A: Model of boat used by Dutch Seaman, Henry Hudson—\$1.00.

"Mayflower"—887: Midget replica of ship which anchored at Plymouth Rock—25c.

"Savannah"—889: First steam-driven boat to cross the Atlantic. 14-in. model—25c.

Viking Ship Model—888: Used by Norsemen in early explorations. 14-in. hull—25c.

"Santa Maria"—759: Simplified design of Columbus' flagship. About 18 in. long—25c.

"U.S.S. Pensacola"—863 and 864: Midget design of 10,000-ton treaty cruiser—50c.

Prairie Schooner—728: Model is quaint reminder of covered-wagon days. Wagon without top, 8 3/4 in. long—25c.

Model Colonial Cannon—735: Perfect 10-in. miniature of guns used during days of 1776. Turned brass and wood—25c.

Blueprint Department, Popular Mechanics Magazine, 200 E. Ontario St., Chicago

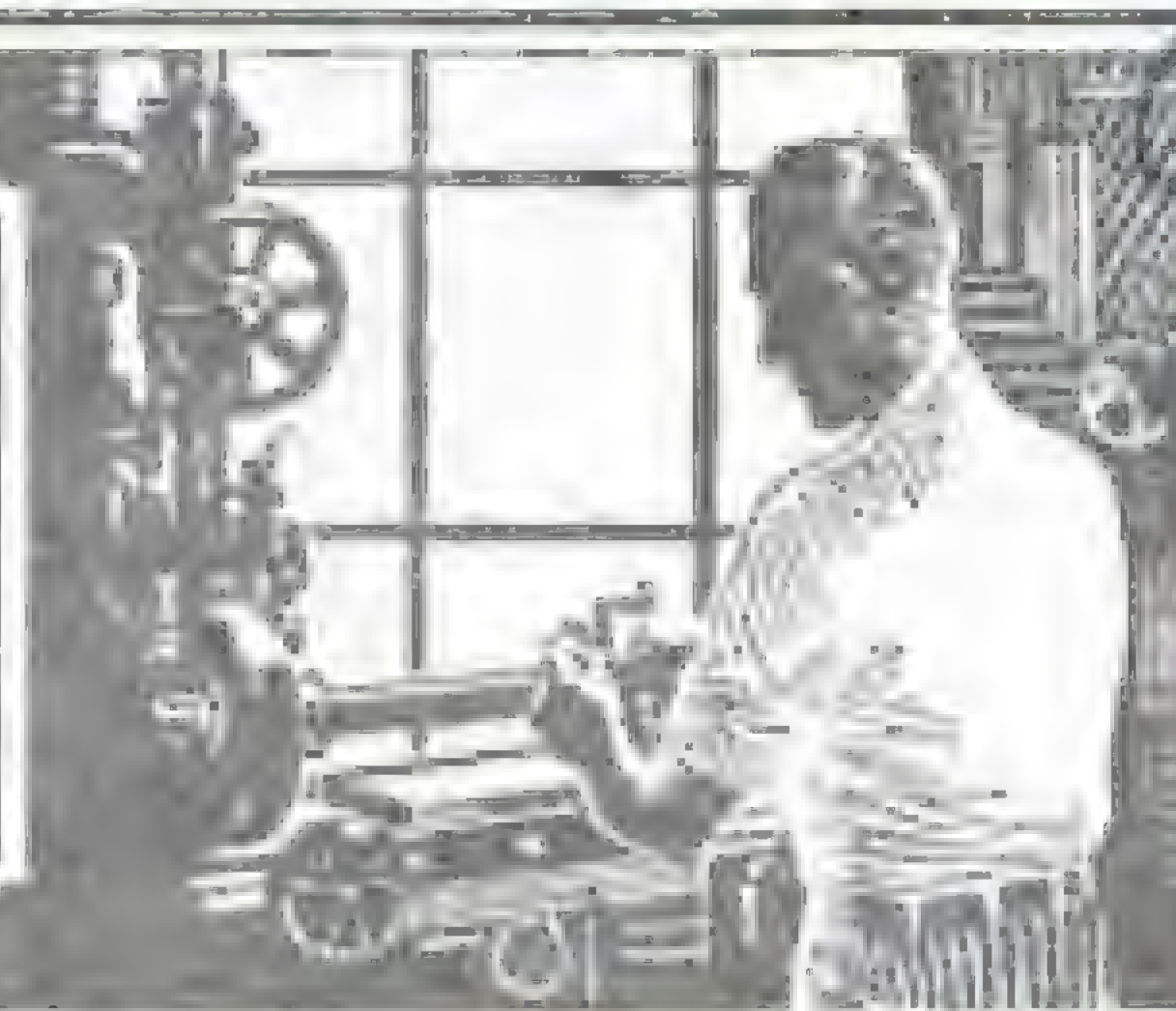


60 Power Tools

Harwin - Luxor Abrasives  
Corp. 63 Wall St. New York



# SHOP NOTES



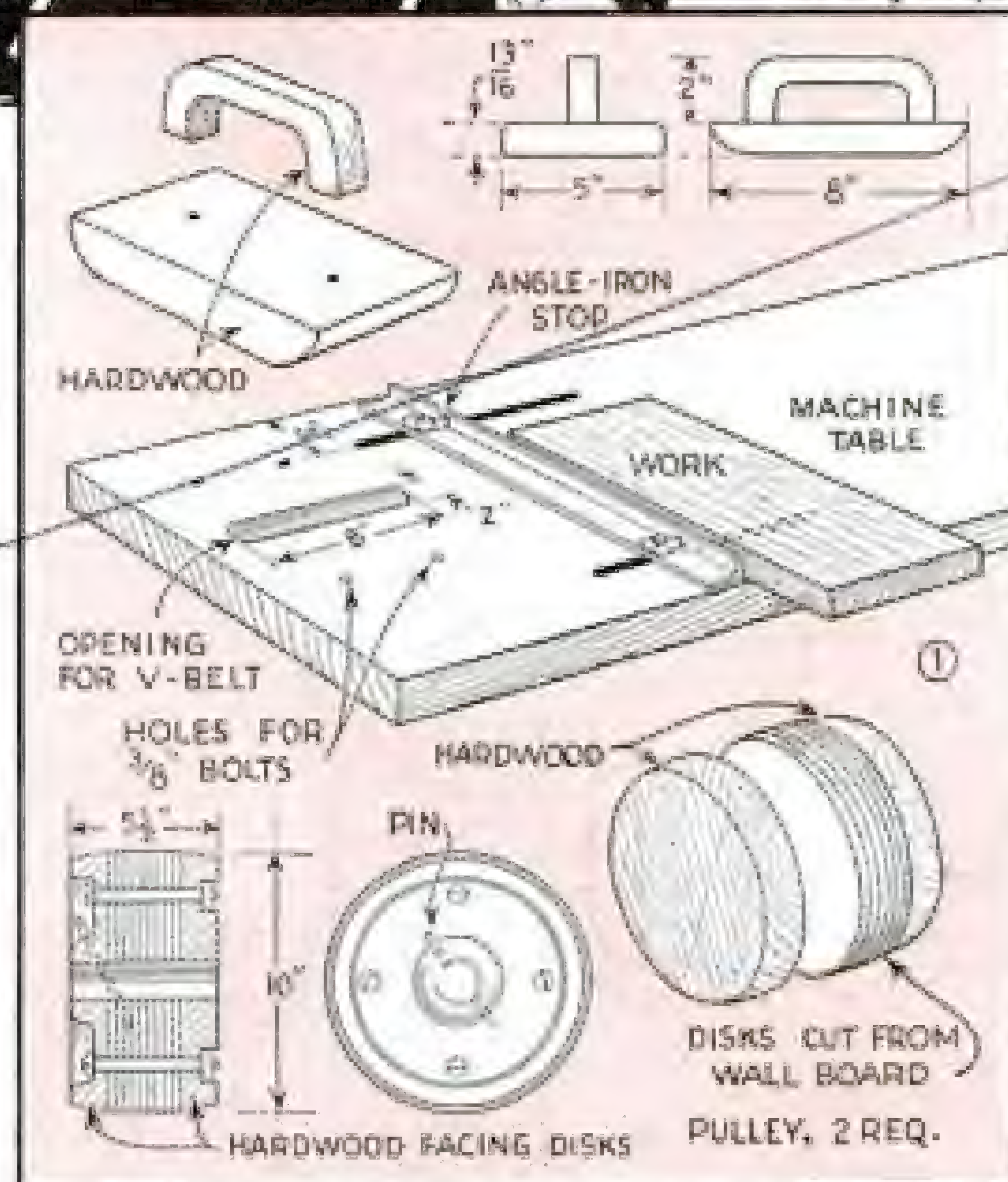
Flexible-  
Belt

## SANDER

Makes Finishing Easy

**B**UILT of odds and ends easy to get most anywhere, this belt sander will handle practically all sanding operations on flat work of the average size. The design permits a delicate control over the cutting action of the belt and you can see what you're doing, as the work is in full view.

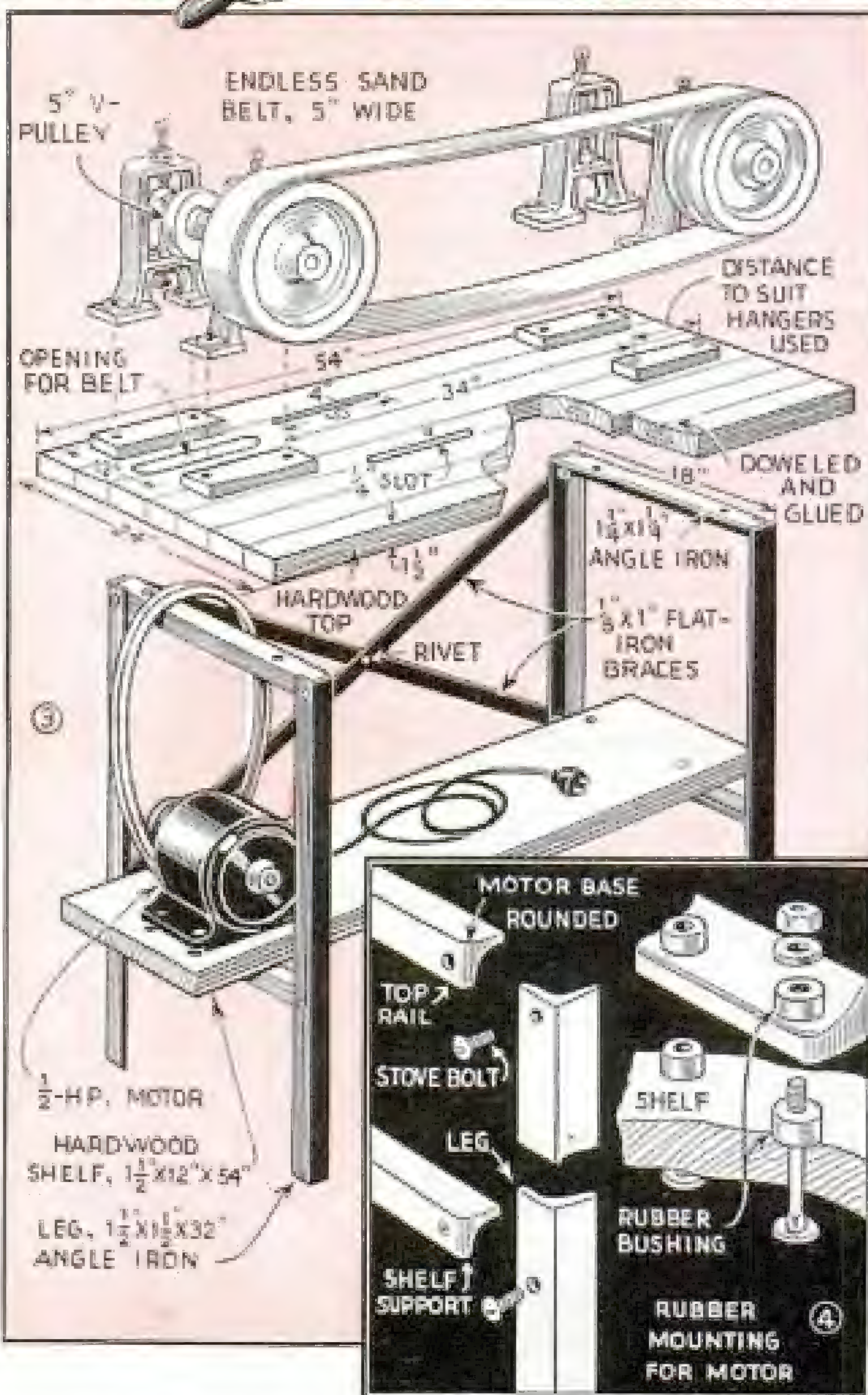
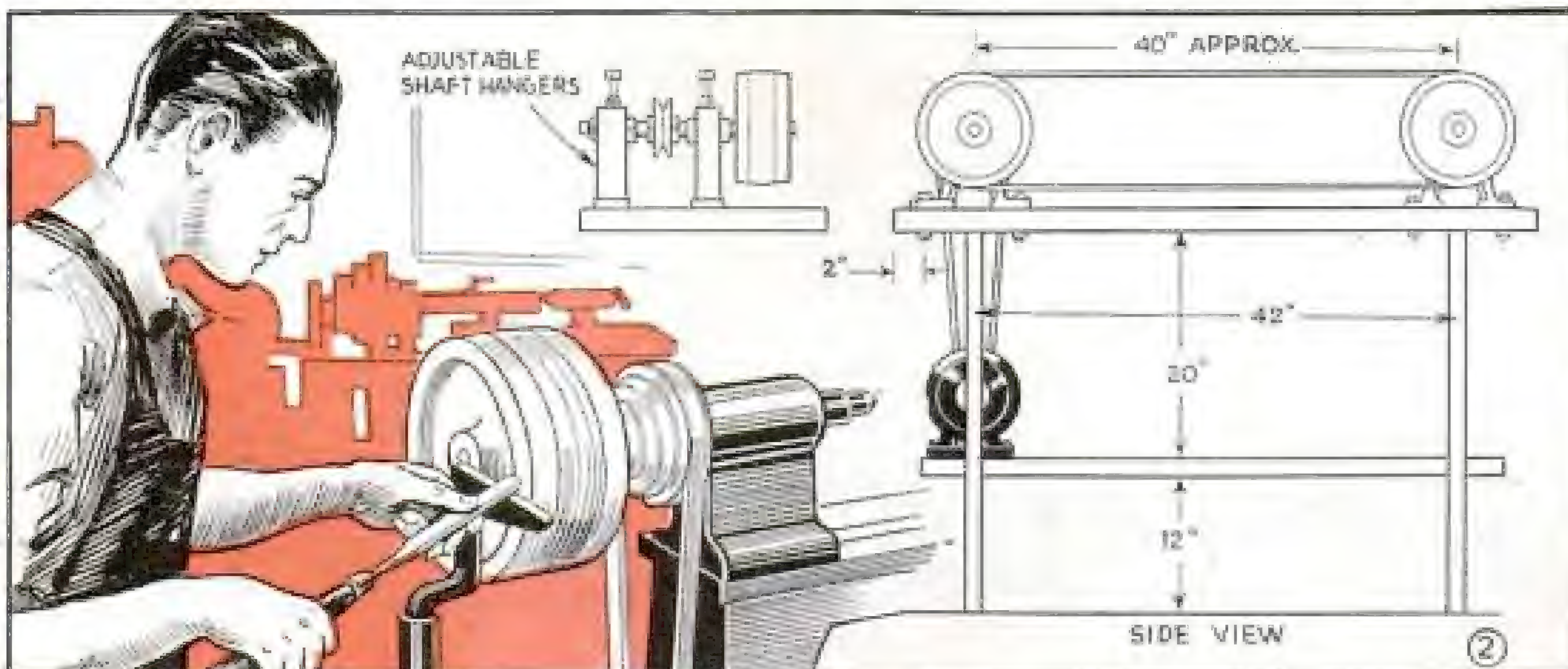
Although you can use any wood or iron pulleys to carry the abrasive belt, Fig. 1 shows how you can make much better pulleys for the purpose right in your own shop. The center section of each pulley is made up of twelve disks of  $\frac{1}{4}$ -in. wall board glued together with casein glue. Then on each side of the center section glue a  $1\frac{1}{2}$ -in. disk of hardwood, such as birch or maple. After turning, four equally spaced holes are bored through the web of each pulley. These take small stove bolts as in Fig. 1. Now center a hole through the hub of the pulley to take the shaft. The method of keying the pulley to the  $\frac{3}{4}$ -in. shaft is also shown. Combining Figs. 1 and 4 inclusive, you have the story of how the sander is assembled. To carry the pulleys you mount four self-aligning



*Delicate finish work on small parts, cutting glued-up panels down to uniform thickness, producing a fine finish on veneered panels—all these operations are easy when you have this belt sander. Materials that you do not have at hand to build it are easy to get most anywhere. The lower details show how to make pulleys out of wall board and hardwood with a friction surface that will prevent slippage of the sanding belt*

minimum 1501  
St. Louis  
Mo.  
1501  
St. Louis  
Mo.





shaft hangers on a hardwood table top, the latter slotted for the V-belt to the motor, and also for the angle-iron stop against which the work is placed. This assembly is mounted on an angle-iron stand made as in Fig. 3, with a hardwood shelf underneath on which the motor is mounted. Fig. 4 gives the details on bolting the iron stand together and also shows how you can mount the motor on rubber bushings to lessen vibration. Use a rubber V-belt to drive. Speed of the pulleys carrying the sand belt should not exceed 1,000 r.p.m. Two small bolts with wing nuts provide the necessary adjustment. The rubbing block is made of hardwood as in Fig. 1, with the ends curved upward and the bottom sanded smooth so that it does not damage the belt.

The important thing in using a sander of this type is to keep the work moving in a slow back-and-forth motion across the table while you press the sand belt into contact with the surface. Only a light pressure is needed to insure a fine finish. Suitable endless belts in various grades are available in the length and width required.

Any sturdy table will do for mounting this sander. It can be bolted to an open bench, or an angle-iron stand like that shown above. A  $\frac{1}{2}$ -hp. motor supplies ample power for any ordinary work. The table can be made larger than that shown, if you wish to increase the capacity of the sander.

■ A putty that insulates against both heat and electricity can be made by pulverizing sheet asbestos and mixing it to a dough with water glass.



## Two Ideas That Help Ease the Pressman's Job



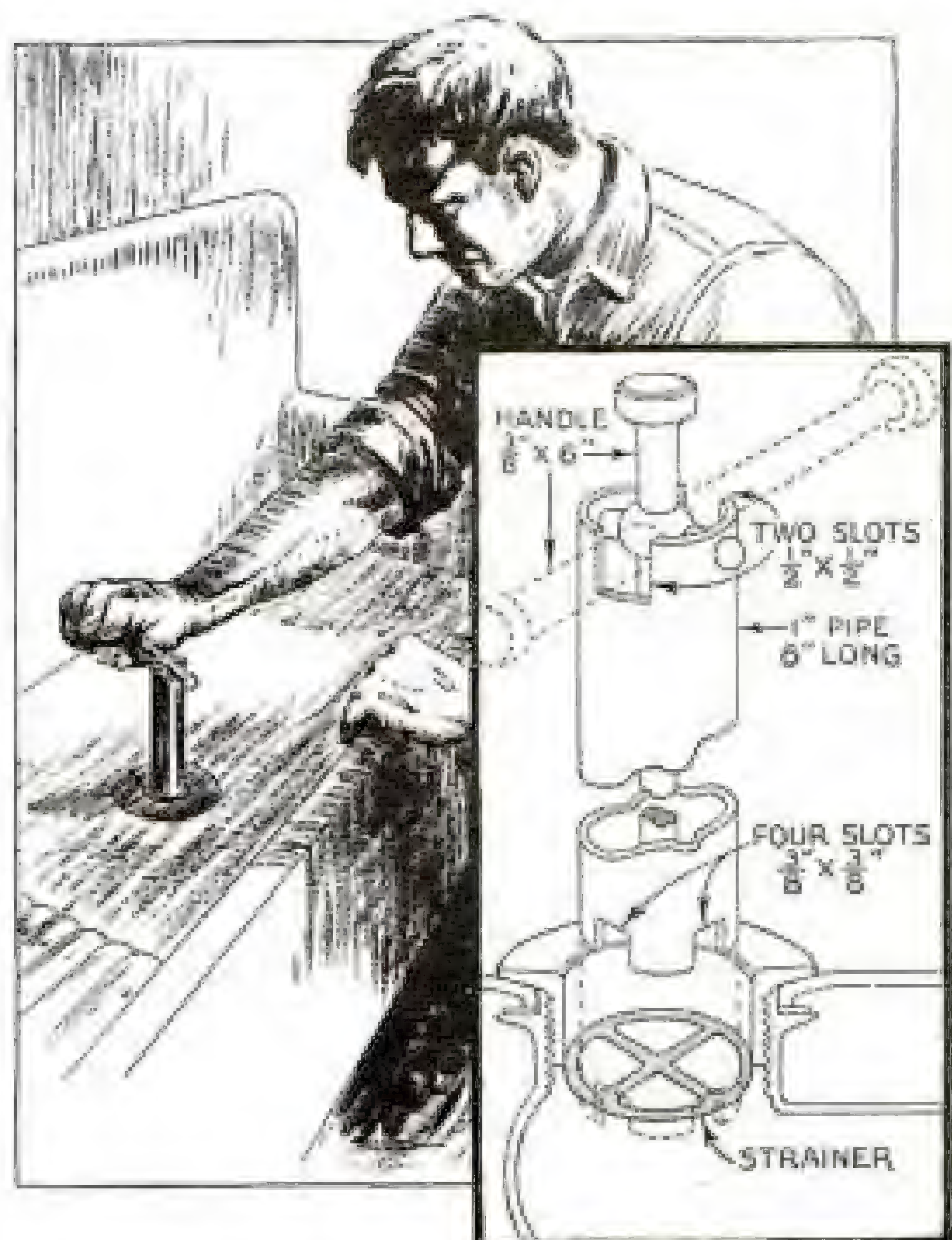
Slit lengthwise along one side and slipped over the edge of the delivery board on a job press, a length of large radiator hose will help cushion vibration against the pressman who is in the habit of leaning against the board when standing for long periods. If air currents from a fan or open window tend to scatter paper stock while operating a press, the roller clamp, shown in the upper right detail, will hold the paper. The clamp is hinged to the underside of the feedboard with two staples.

## Wrench for Removing Sink Strainers Has Folding Handle

Here is a wrench that will remove tight sink strainers in a jiffy. Made from a short piece of scrap pipe, it costs nothing, and takes little space in your tool kit. Four equally spaced slots in the lower end of the pipe straddle the strainer arms, and two larger slots in the upper end take the handle. This is a bolt or rod, with the ends enlarged, which slides through a pivot, the latter being an old faucet handle with the hole reamed and the ends shouldered to fit holes drilled in the pipe. To insert the pivot, it will be necessary to slot one of the holes and then solder the piece, thus removed, in place after installing the pivot.

### Bridle Bit Sheathed in Winter

During winter when a cold bridle bit is likely to injure a horse's mouth by sticking to its lips, I wrap the bit with rubber. Tire patching, when wrapped spirally around the bit, will last all winter, and will not come off if the ends are overlapped and cemented.—John Halvorson, Regan, N. Dak.



If you make up one of these wrenches and carry it in your tool kit, you are prepared to remove any tight sink strainer without difficulty.



## Sickle Section on Pitchfork Cuts Sheaf Strings



*Cutting strings on sheaves of grain to feed livestock is a simple job with this cutter*

When small grains are fed to livestock in the sheaf, a section from a mowing-machine or binder sickle riveted to a pitchfork will save time and labor in cutting the sheaf strings. Slipping the outside tine, which carries the section, under the string as shown, severs it with one stroke, after which the grain is spread for feeding.

## Clerk's Crayon Always at Hand on Rubber Finger Tip



slipped over the index finger. The user can address packages and check them in

Reducing waste motion to a minimum, this crayon attachment for the finger is a time-saver for shipping clerks. A crayon is inserted into a hole made in the solid end of a rubber crutch tip, which is then

or out without removing the attachment from the finger, thus saving time in picking up or laying down the crayon while handling boxes and packages.

## Micrometer Attachment Checks Tapered Work

Machinists who have difficulty in accurately measuring the taper per inch of a tapered piece with a scale and micrometer will find this attachment for the latter handy to determine when the work has been advanced exactly 1 in. over the micrometer anvil. The attachment is a piece of flat steel  $\frac{3}{8}$  in. thick, having a shoulder at each end, and a hole reamed to fit snugly over the micrometer anvil. The center of the hole is  $\frac{1}{4}$  in. from one shoulder and  $1\frac{1}{4}$  in. from the other one. The attachment can be any size provided one shoulder is 1 in. farther from the hole than the one on the opposite side.



## Bread Knife Has Pistol Grip to Ease Wrist Strain

In restaurants and other places where many loaves of bread must be sliced, a detachable saw handle screwed to the

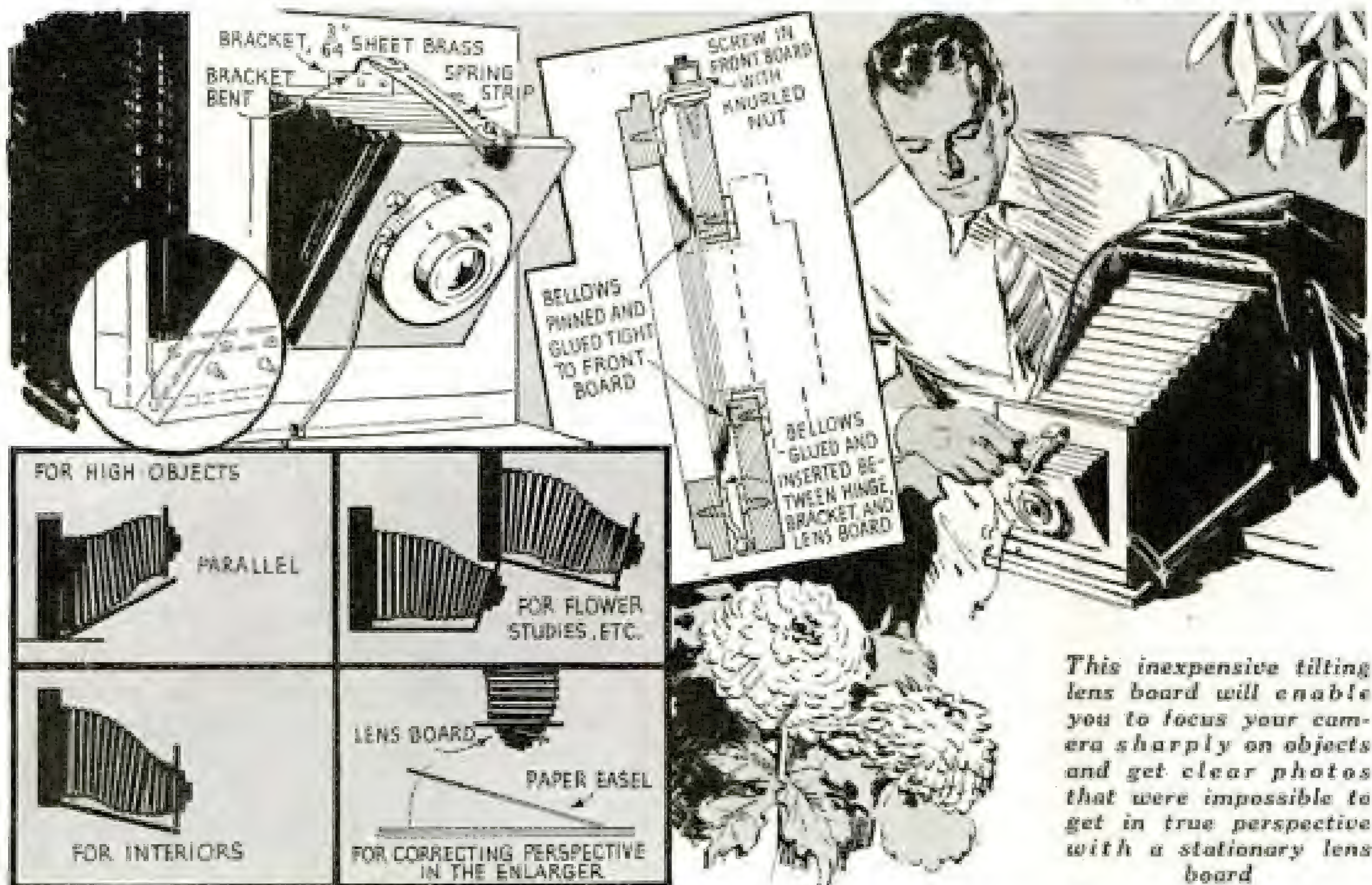


*Keyhole-saw handle is attached by reaming rivet holes in knife blade to take bolts of handle*

bread knife will make the task less tiresome. The handle permits the operator's wrist to assume a natural position, thus offering an easy cutting stroke with plenty of grip and free action.



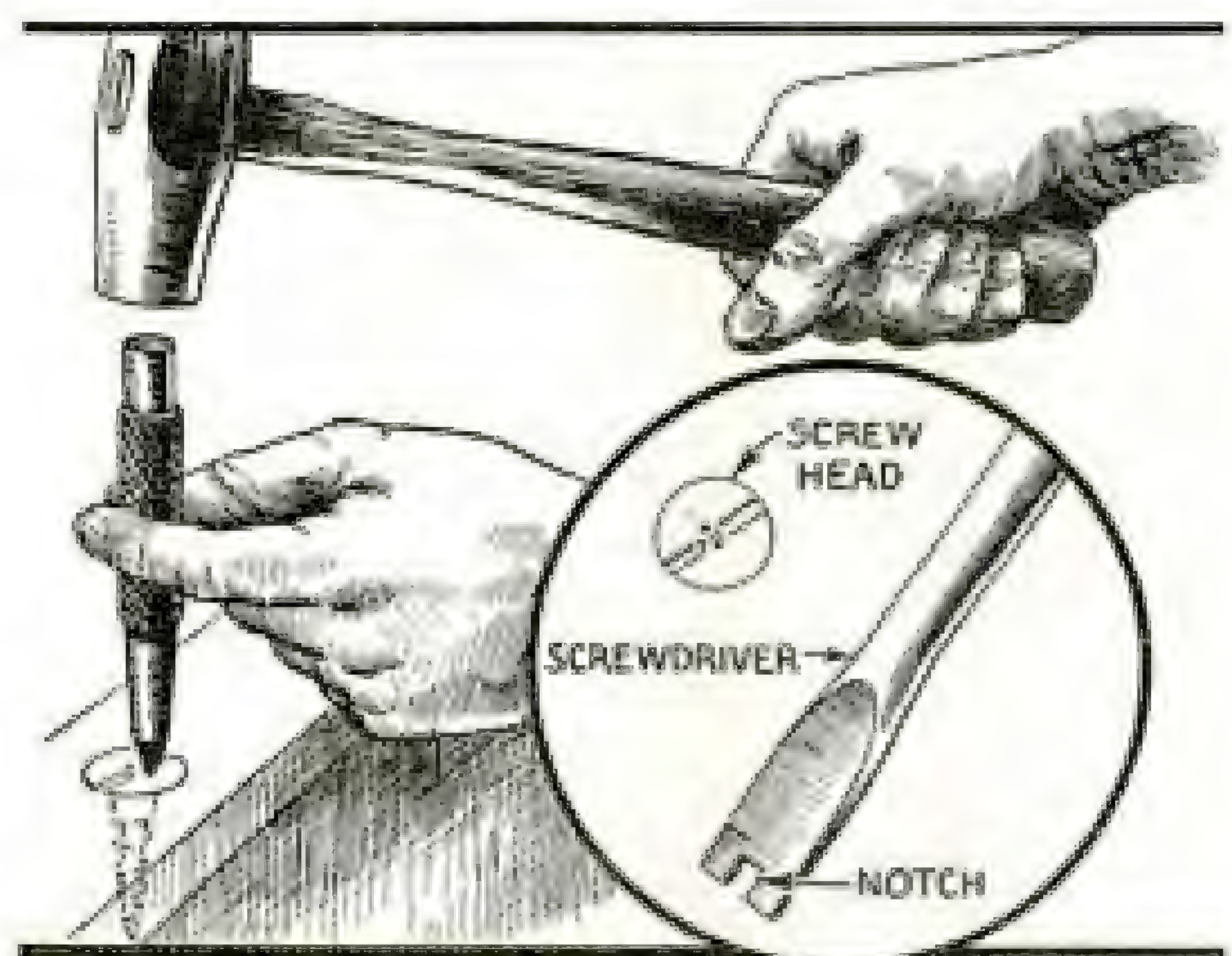
# Tilting Lens Board Broadens Your Photo Field



By fitting any camera having a ground glass with this simple tilting lens board at a cost of less than two dollars, you can convert it into a camera that greatly increases the possibilities of your photographic work. With such a camera, you can take portraits from a high or low level, bringing the body or shoulders into focus without stopping down the diaphragm. Using the camera for view work, you can photograph high architectural objects, or you can go to the other extreme and get flower beds and hundreds of other views not possible without a tilting lens. In addition to this, you can use a tilting lens on your enlarger, making it possible to correct faulty perspective of old negatives. To make the tilting board, the camera lens assembly is removed and is mounted on a wood block. The opening in the camera lens board is then enlarged to take a short bellows, which you can get from an old hand camera. The bellows is glued over the enlarged opening and to the back of the tilting board, which is then hinged in place. Care must be taken to get a light-tight job. A bracket and a flexible arm of spring brass hold the adjustment of the tilting board.

## Removal of Locks Prevented by Altering Screw Heads

To prevent locks and other objects attached with screws from being removed, bead over the center portion of the screw slots with a punch as shown, so that a



*Center portion of screw slot beaded over requiring special screwdriver to remove it*

regular screwdriver cannot be inserted. For driving such screws, you can notch the end of a screwdriver to straddle the filled portion of the screw slot.



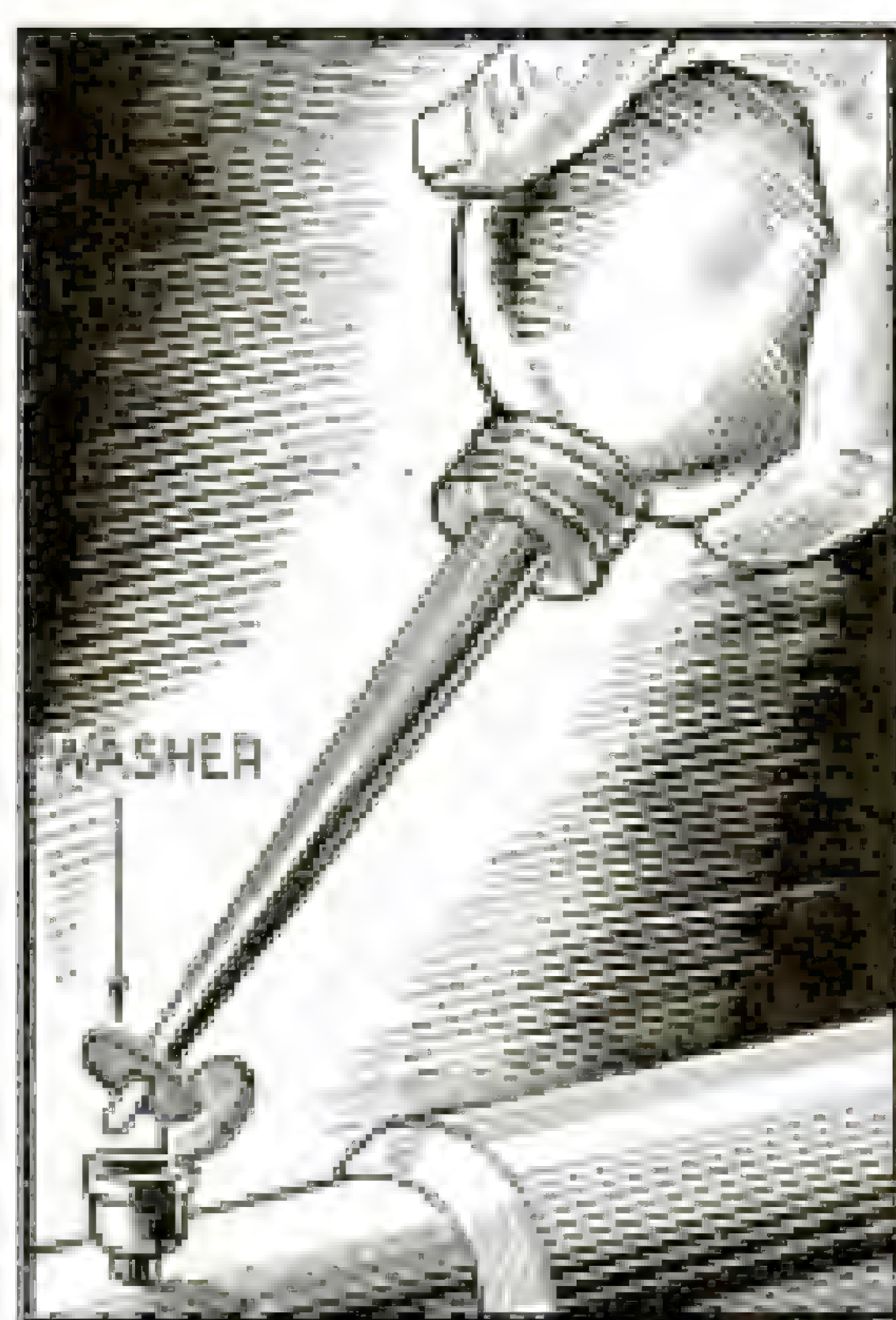
## Adjustable Shelf on Ladder Holds Workman's Tools



*Time lost in going up and down a ladder after tools is saved with this tool shelf*

Painters, carpenters and others who often have to work on a ladder will find this tool shelf a time saver. It is quickly attached to two adjacent rungs on the ladder to hold tools conveniently at any height. Two flat-iron props, forked at the lower ends, straddle one rung, and support the front side of the shelf, while two hooks driven into rear edge of the shelf fit over the other rung.

## Oilcan Has Washer on Spout to Lift Spring Caps

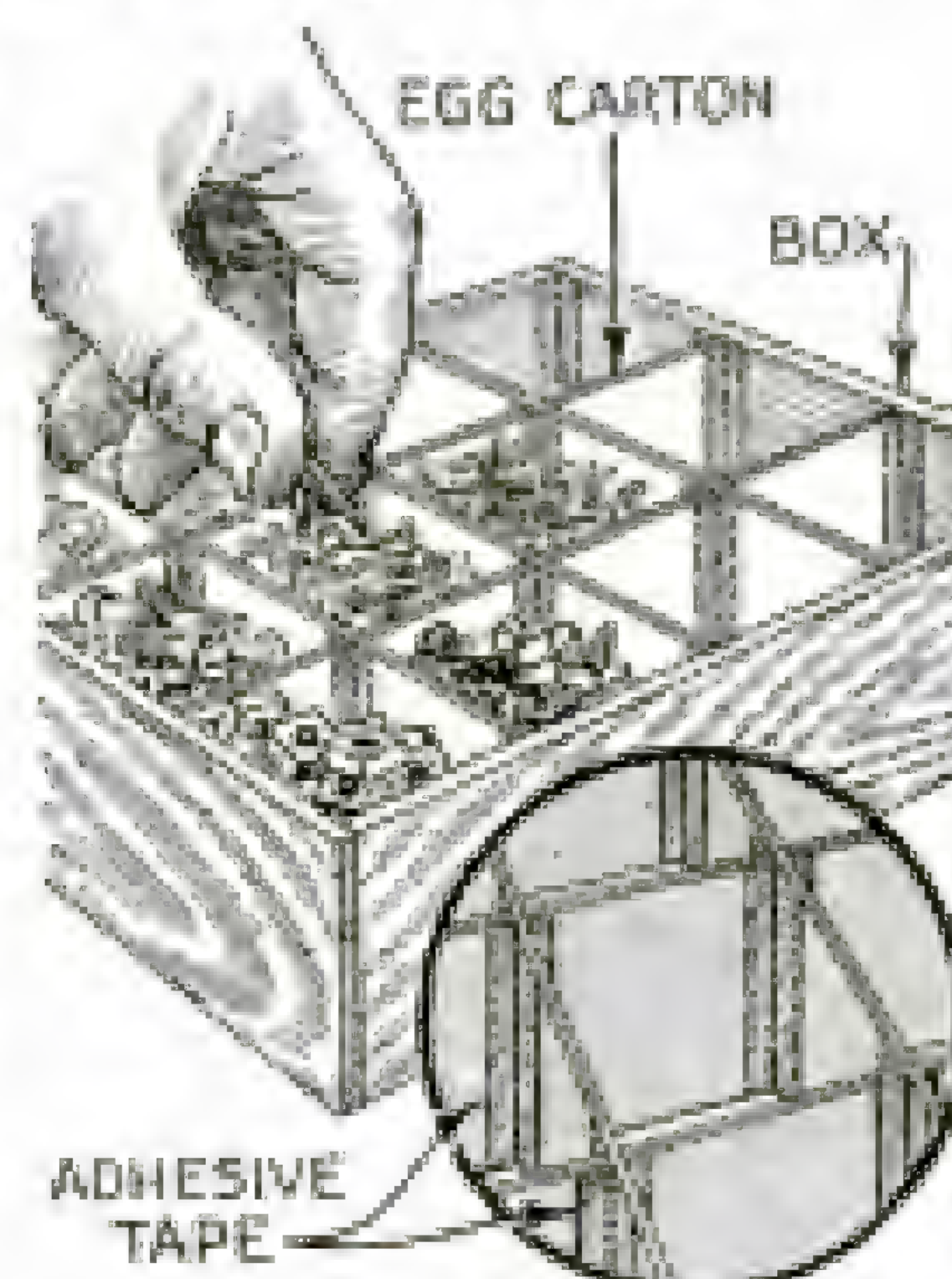


When a dust-proof oiler is used in a hard-to-reach position on a piece of machinery, a small washer soldered to the oilcan spout will solve the problem of lifting the spring cap. A small copper washer from a harness rivet is

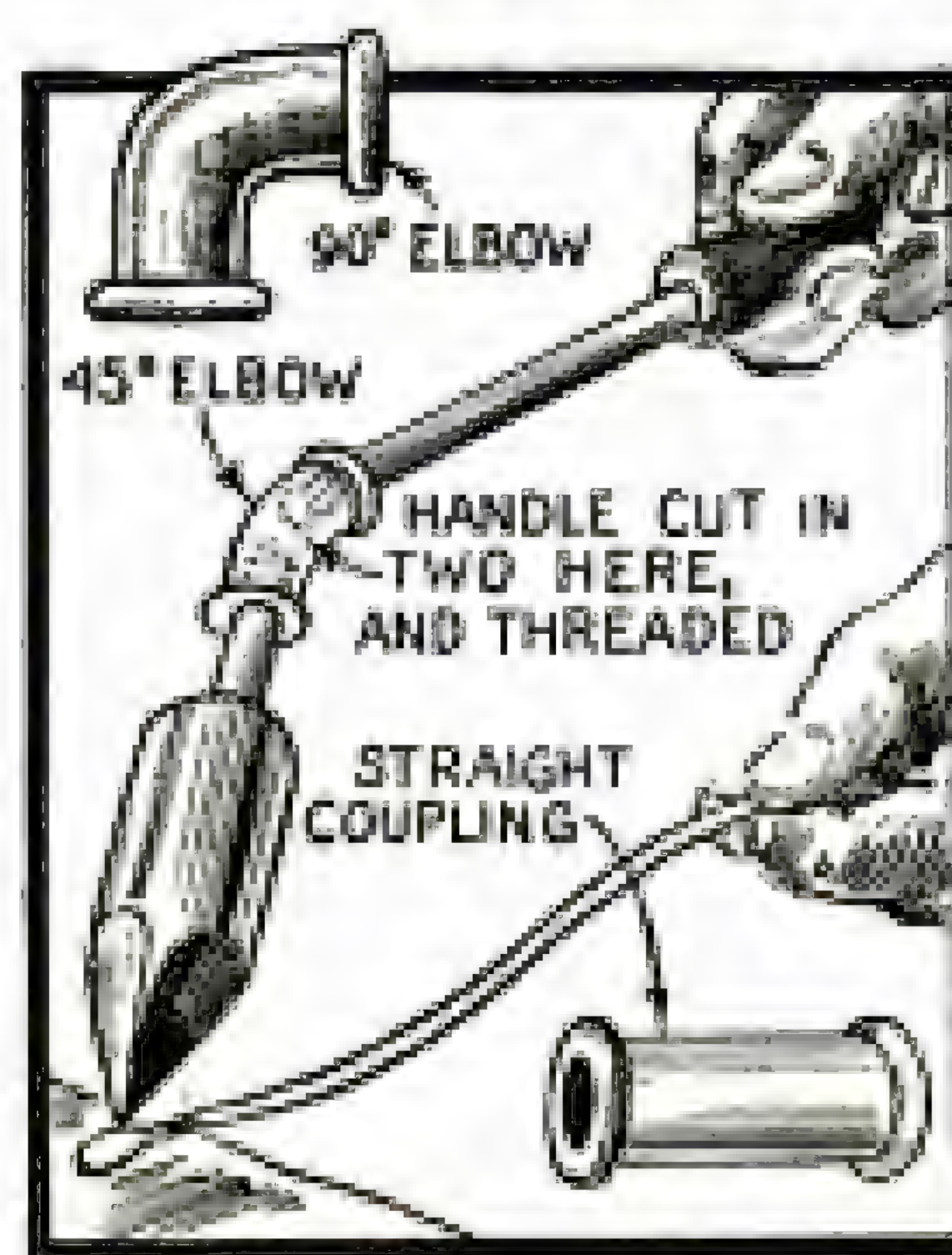
just about the right size for this purpose.  
—Roscoe Osborn, Vermilion, S. Dak.

## Small-Parts Kit Improvised from Egg-Case Separator

With a few strips of adhesive tape, the average egg-case separator can be set inside a box and made rigid enough to hold small parts such as screws, nails, nuts, etc., properly separated and easily accessible. Besides reinforcing the corners, the tape is used to hold the lower part of the separator firmly on the bottom of the box.



## Usefulness of Soldering Iron Increased with Elbows



By simply sawing a soldering-iron handle in two and threading the severed ends, you can connect them with 45 or 90° pipe elbows to hold the end of the iron at different angles. When a straight-handled iron is needed, remove the elbow and screw on a pipe coupling.

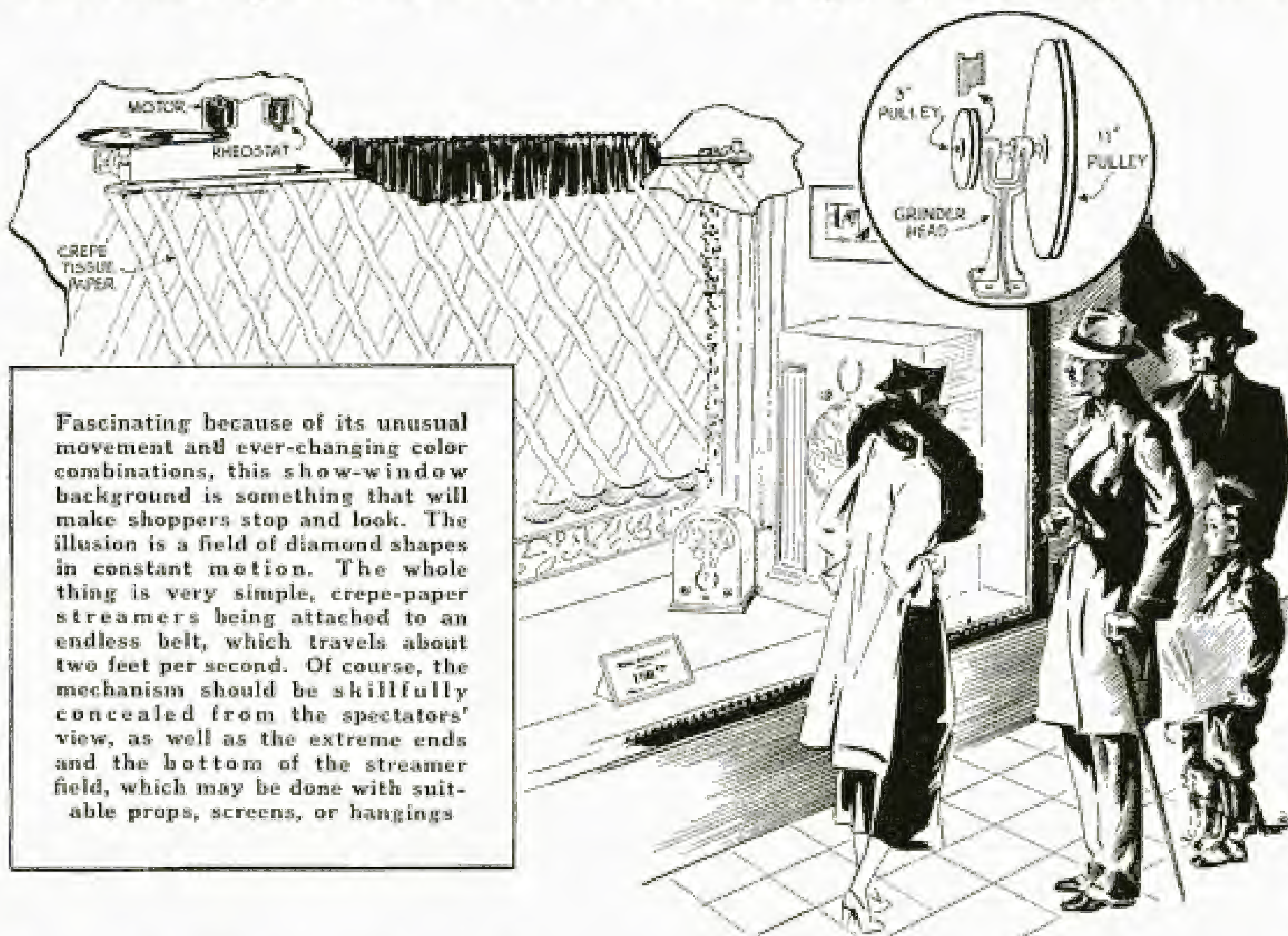
—W. C. Wilhite, Edelstein, Ill.

## Getting Clear Detail in Photos of Light and Dark Objects

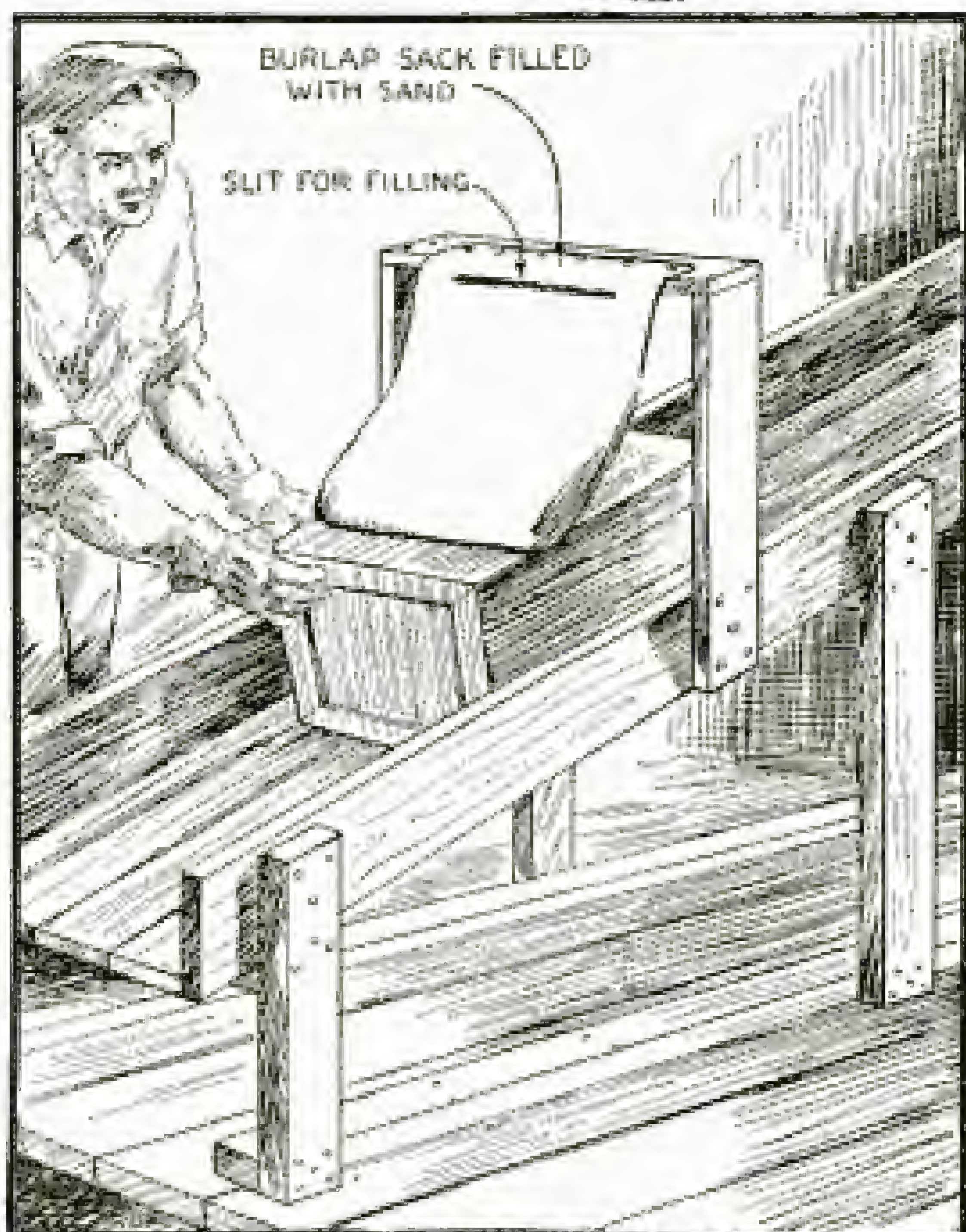
When photographing a picture which has a very light subject in the foreground and a very dark subject in the background, I find it best to use the longer exposure time necessary for the dark subject, and then develop the film only about two-thirds the normal developing time. This enables me to bring out the detail of both the light and dark objects.—Wayne G. Gross, Tilden, Nebr.



## Store Display Has Ever-Changing Background



## Sandbag Brake Checks Speed of Boxes Coming Down Chute



Speed of boxes sliding down chute greatly retarded by sudden impact against sandbag at lower end

In a factory where boxes of merchandise are sent down a chute to the loading platform, this brake is used at the lower end of the chute to slow down the movement of the boxes. The brake is merely a sack filled with sand and suspended above the chute as shown. A slit near the top allows sand to be added or removed to get the necessary resistance.

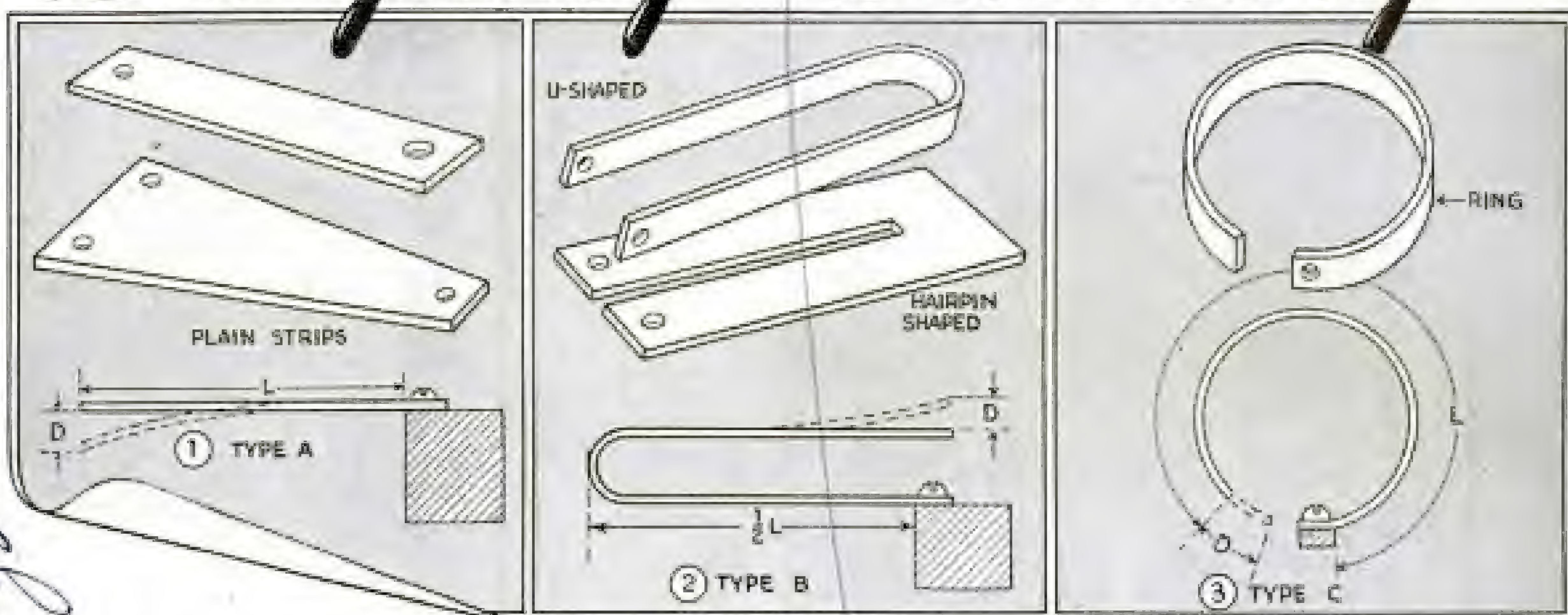
## Dense Smudge in Orchards by Burning Tires

Owners of small orchards may protect their trees from frosts at little cost by following the method of a California orchardist. Without any expense for smudge pots or crude oil, this man collects a supply of discarded auto tires, distributing them in his orchard. When danger of frost comes, he pours a little gasoline on each tire and ignites it. The tires burn readily, sending off heat and dense clouds of smoke. —Oscar H. Roesner, Live Oak, Calif.



W. M. Chase Valve Co.  
4743 W. Lake. Chicago  
also - 1600 Regent Ave. Detroit

# Designing and Building

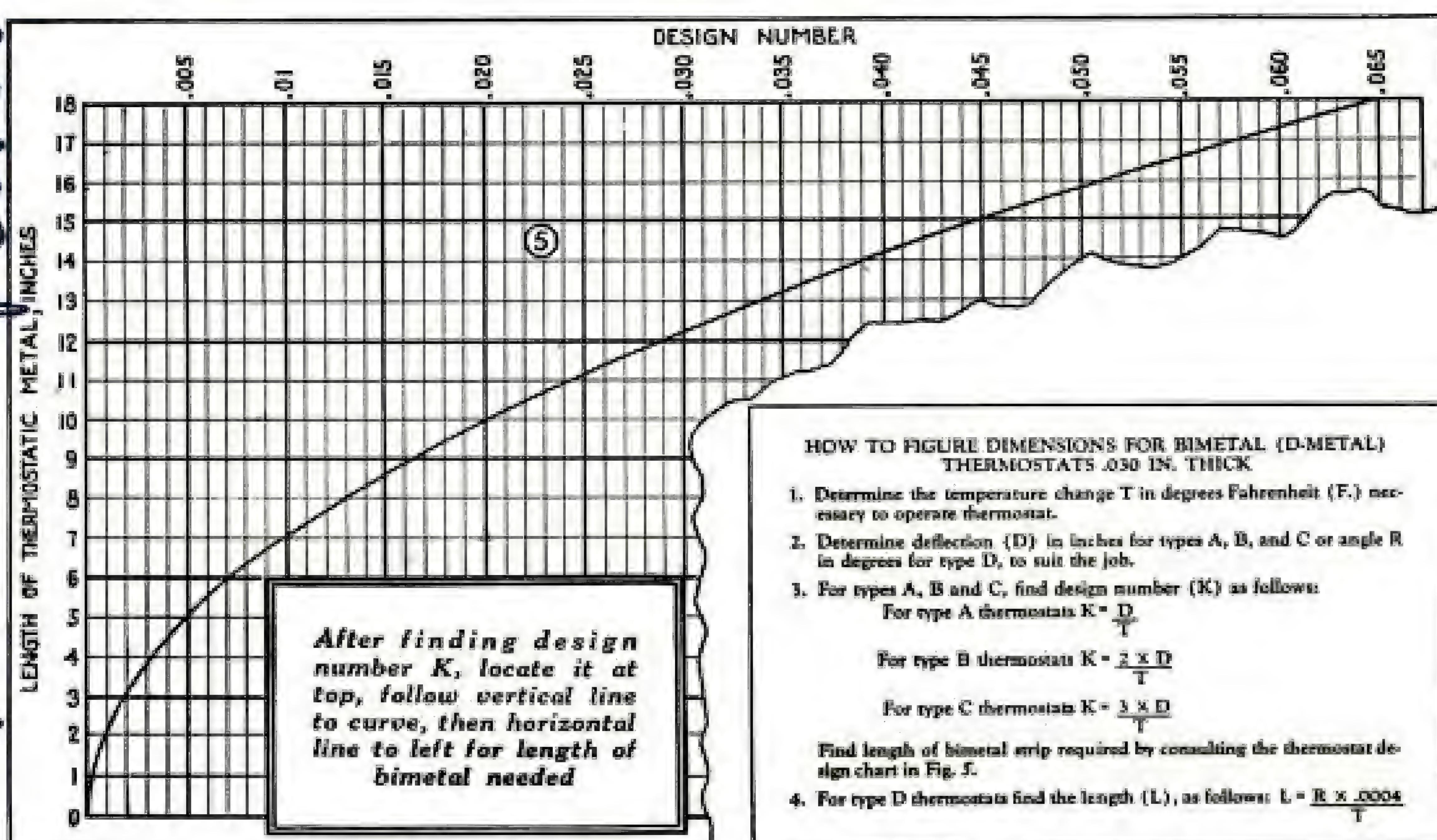


Straight strip thermostats, type A, are used where a temperature difference of 5° F. or more is allowable, as in electric irons, toasters, tire vulcanizers, water heaters, etc. U-shaped and hairpin thermostats, type B, are for sensitive units where vibration of the element must be reduced or where space limitations prevent use of strip thermostats. Ring thermostats, type C, are used for constricted spaces

By C. A. CROWLEY

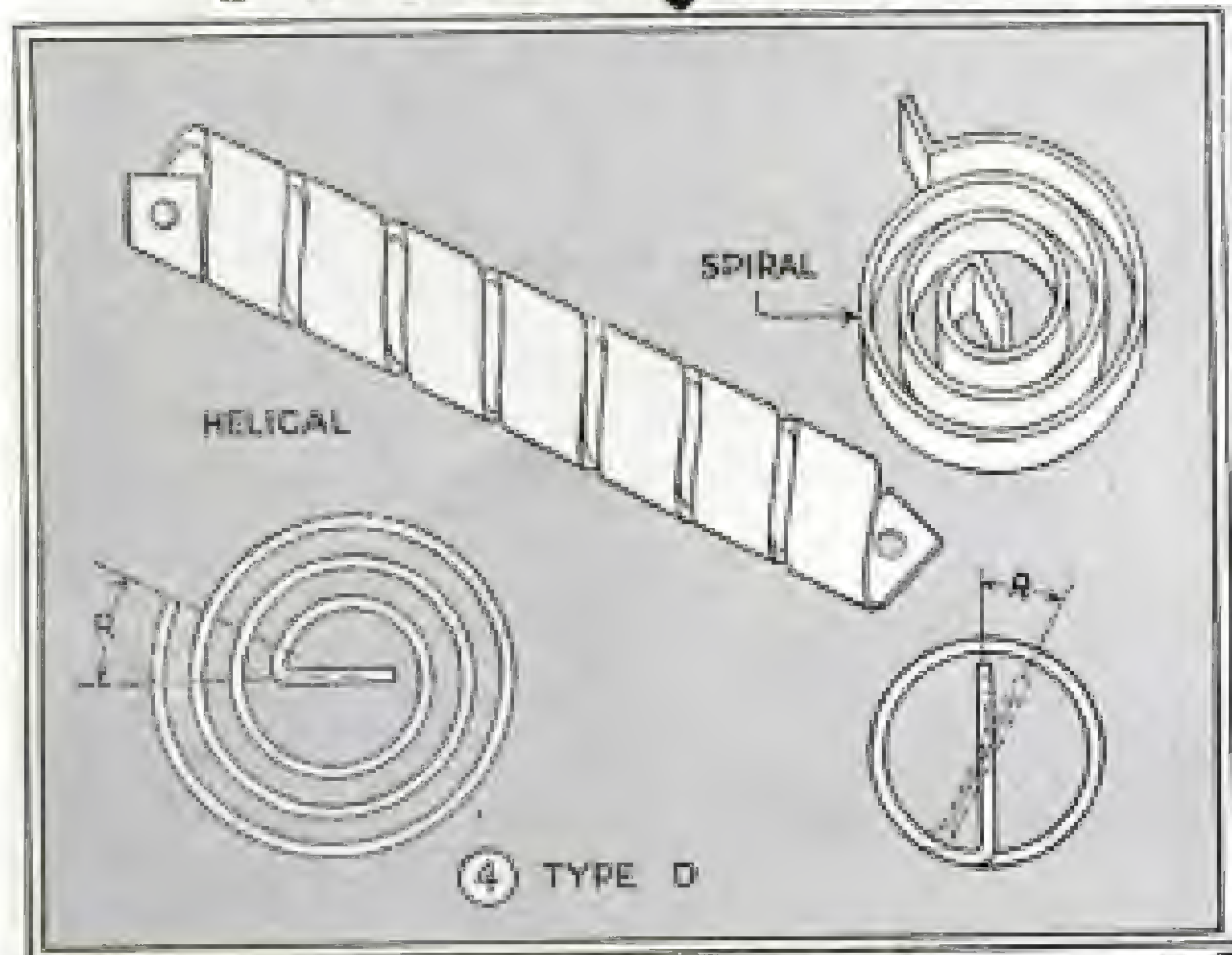
AS A METHOD of automatically controlling temperature, bimetal thermostats are used in hundreds of practical, everyday applications from flatirons to air-conditioning units. Constructing thermostats for almost any job is purely a matter of design and careful workmanship in assembling as each thermostat must be

figured for its own particular application. Therefore, to convey as much usable information as possible, this article will show how to design various types of thermostats from .030-in. bimetal, giving the principles of construction and arrangement, without involving complicated technical details or mathematical calculations.





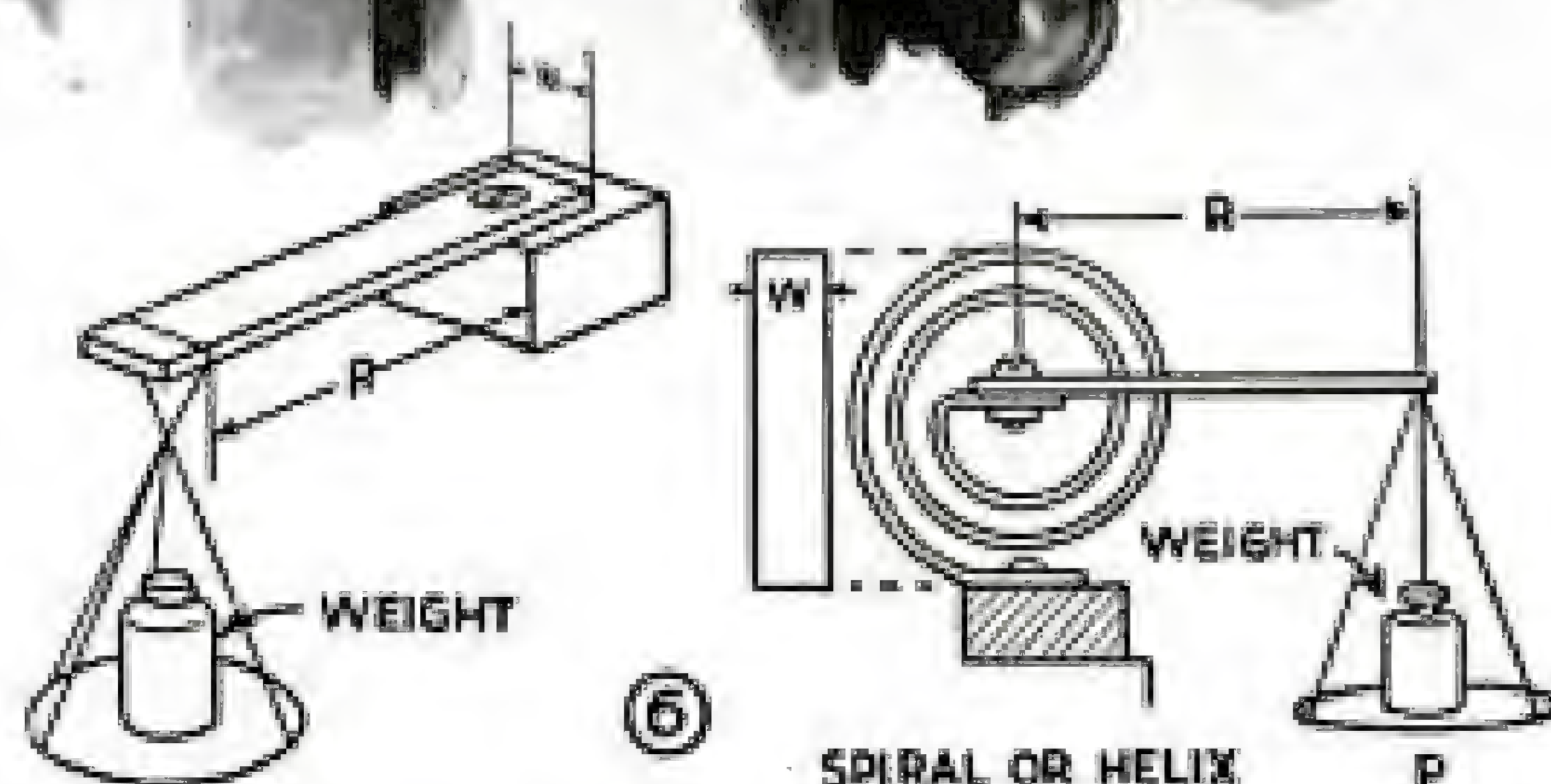
# THERMOSTATS



*Helical and spiral thermostats, type D, are capable of producing a large movement within relatively small temperature variations—especially suitable where rotary motion is desired*

**How a Thermostat Works:** Thermostatic bimetal consists of two sheets of metal fused together—one having a high rate of expansion when heated and the other a very low rate. This bimetal has the property of bending when heated, always away from the metal which has the large expansion rate. When in doubt as to the expanding side, heat the strip with a match and note the bending. A standard grade of bimetal known as D-metal .030 in. thick, and having an active working range of from  $-50$  to  $800^{\circ}\text{F.}$ , can be purchased in sheets and strips at low cost. The metal will stand  $1,200^{\circ}\text{F.}$  without injury; however, it is only sensitive up to  $800^{\circ}\text{F.}$

Fig. 1 shows a plain strip type of thermostat, which is used to open and close electric circuits when several degrees of temperature can be allowed. As an illustration, the unit may be used when a heater must be turned on at, say  $70^{\circ}\text{F.}$  and off at  $75^{\circ}\text{F.}$  Subtracting  $70^{\circ}$  from  $75^{\circ}$  gives  $5^{\circ}$  as the temperature difference which must operate the bimetal element. In all cases where temperature difference, called  $T$  in the formulas, is used, the difference between the high and low value of temperature is to be used. Of course, straight strips can be used when the temperature difference is more than  $5^{\circ}$  with



$$\text{PULL IN LBS.} = \frac{W \times S}{6 \times R} \quad \left| \quad \begin{array}{l} \text{WIDTH OF STRIP} \\ \text{REQUIRED} \end{array} = \frac{6 \times R \times \text{PULL REQ. IN LBS.}}{S} \right.$$

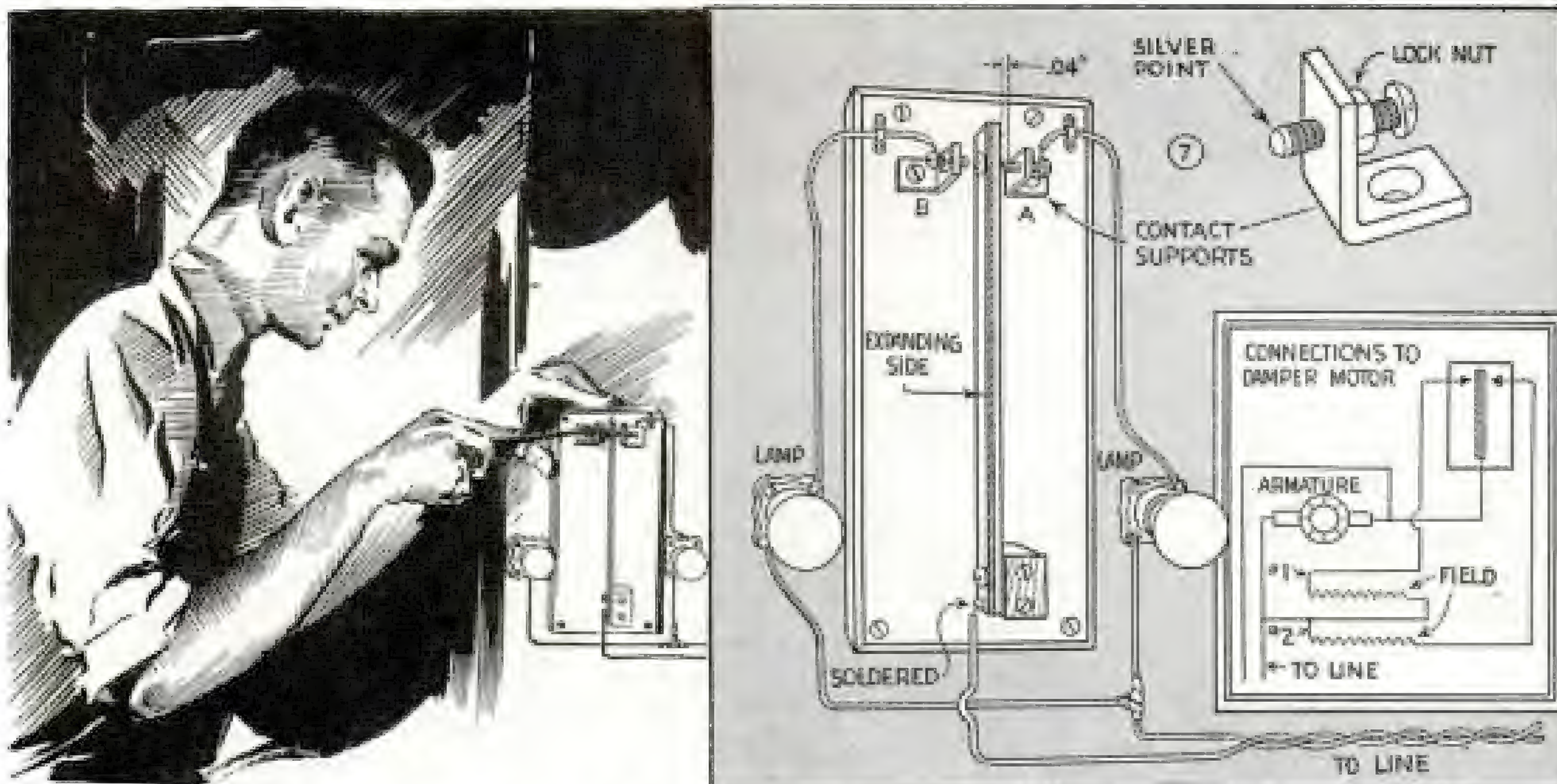
(SEE TABLE BELOW FOR VALUE OF S)

USE PROPER VALUE OF S TO SUIT HIGHEST TEMPERATURE OF THERMOSTAT			
TEMPERATURE	S	TEMPERATURE	S
$150^{\circ}\text{F.}$	27.0	$700^{\circ}\text{F.}$	13.5
$300^{\circ}\text{F.}$	22.5	$900^{\circ}\text{F.}$	9.0
$500^{\circ}\text{F.}$	18.0	$1200^{\circ}\text{F.}$	2.7

*Pull of any thermostat in pounds can be calculated readily by following this simple method*

even more efficient results. For operation on a smaller temperature difference a spiral or helical unit should be used. Straight strip thermostats are used to control the heat of electric irons, toasters, waffle irons, tire vulcanizers, water heaters, ovens, room thermostats and aquarium thermostats. Fig. 2 shows the U-type and "hair-pin" type of thermostats. The latter is made by cutting a slot into a flat strip of





One of the most popular applications of the thermostat is for controlling furnace dampers. This drawing shows the connections for testing the thermostat while the insert shows how to modify a 6-volt motor to serve for damper control. Silver contacts, which minimize arcing, are provided on the movable end of the thermostat and on the adjustable screws A and B

bimetal. The movement of the U-shaped section of metal is indicated as bending upward, which means that the brass or expanding metal is on the inside of the U. If the U-shape were bent in the opposite way so that the brass would be on the outside, the U would tend to close when heated. This form of element is used for sensitive units where a straight strip would be in the way or when it is desirable to reduce vibration in the element. The movement of the U-shaped element is one-half that of a straight element of the same total length; however, the pull or force which it exerts is twice as much provided the width of the strip is the same in both cases. U-shaped elements are used in some water-heater thermostats, damper controls, gas-stove safety pilots, chicken brooders and incubators, and fire alarms. Fig. 3 shows a ring type of thermostat. The element is bent in such a manner that the brass is on the outside of the ring. The movement produced by the ring unit is one-third as much as is produced by a straight strip of equal length. This form can be used to advantage when space is at a premium. It is used in some air-conditioning thermostats and for purposes where small size is important. Fig. 4 shows methods of forming thermostats which will produce large movement with a minimum of temperature change. The helical

and spiral forms are used when rotary motion is to be produced by heat. In designing a thermostat it is first of all necessary to decide upon the type of unit which is to be built. This is determined by considering the movement required of the unit as already explained. To explain the use of the design charts, we will work out a complete design for a straight strip thermostat.

**Designing Straight Strip Thermostats:** We will first work out all of the details required to build a furnace-control thermostat such as is shown in Fig. 7. When the temperature becomes too high the thermostat must close the furnace damper by operating a damper motor, and vice versa. Special damper motors may be used or a 6-volt, a.c. or d.c. motor may be modified by winding two fields in place of one and connecting them as shown in the detail of Fig. 7.

To find the length of the bimetal strip needed, first assume values for the movement of the element required to make and break the electrical circuits. A movement of .04 in. will be satisfactory in most cases. The thermostat should turn on the heat when the temperature drops to, let us say 68° F. and turn it off at 76° F. Subtracting 68 from 76 gives us 8° as the temperature difference, which must cause the thermostat to move .04 in. Consulting the



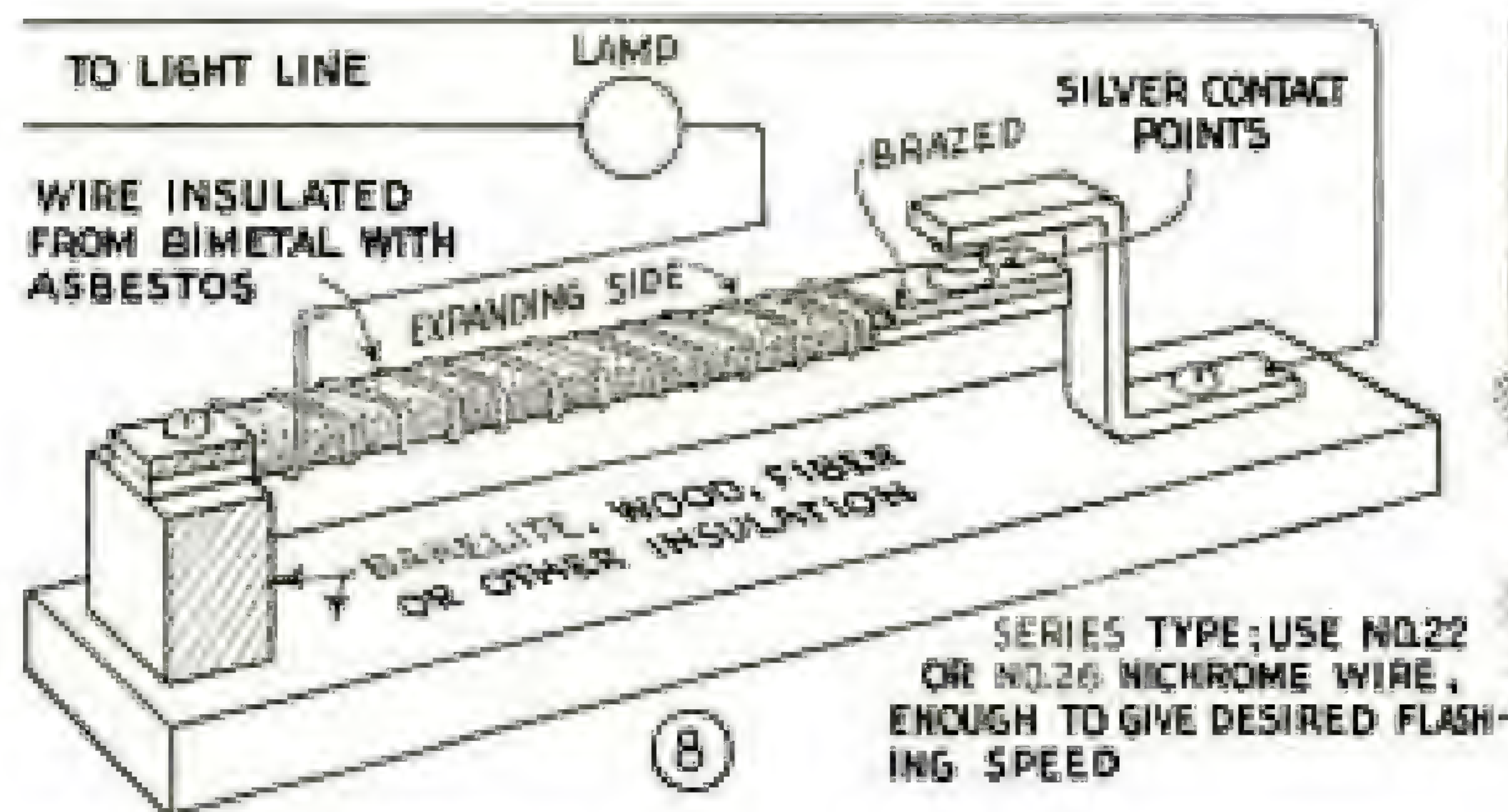
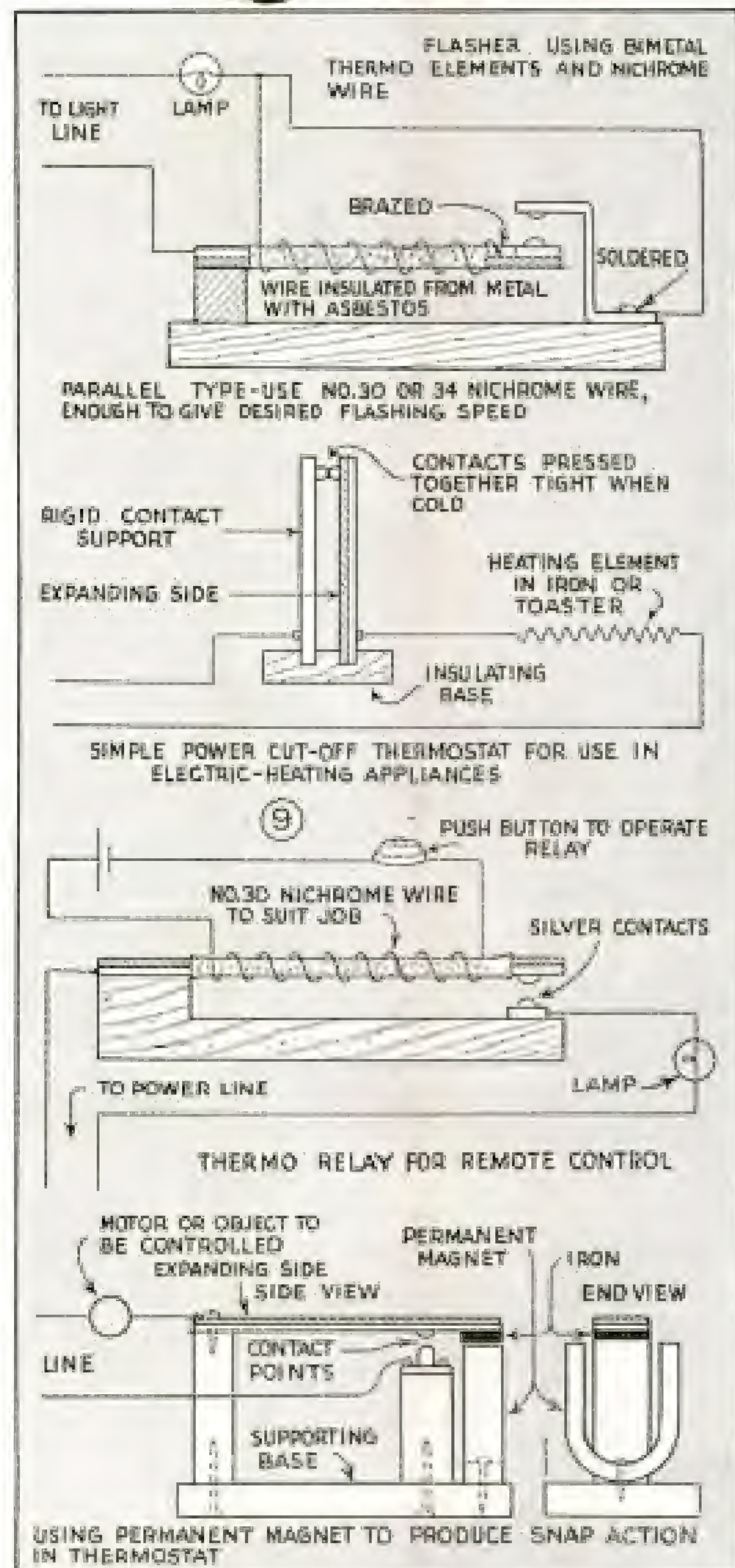


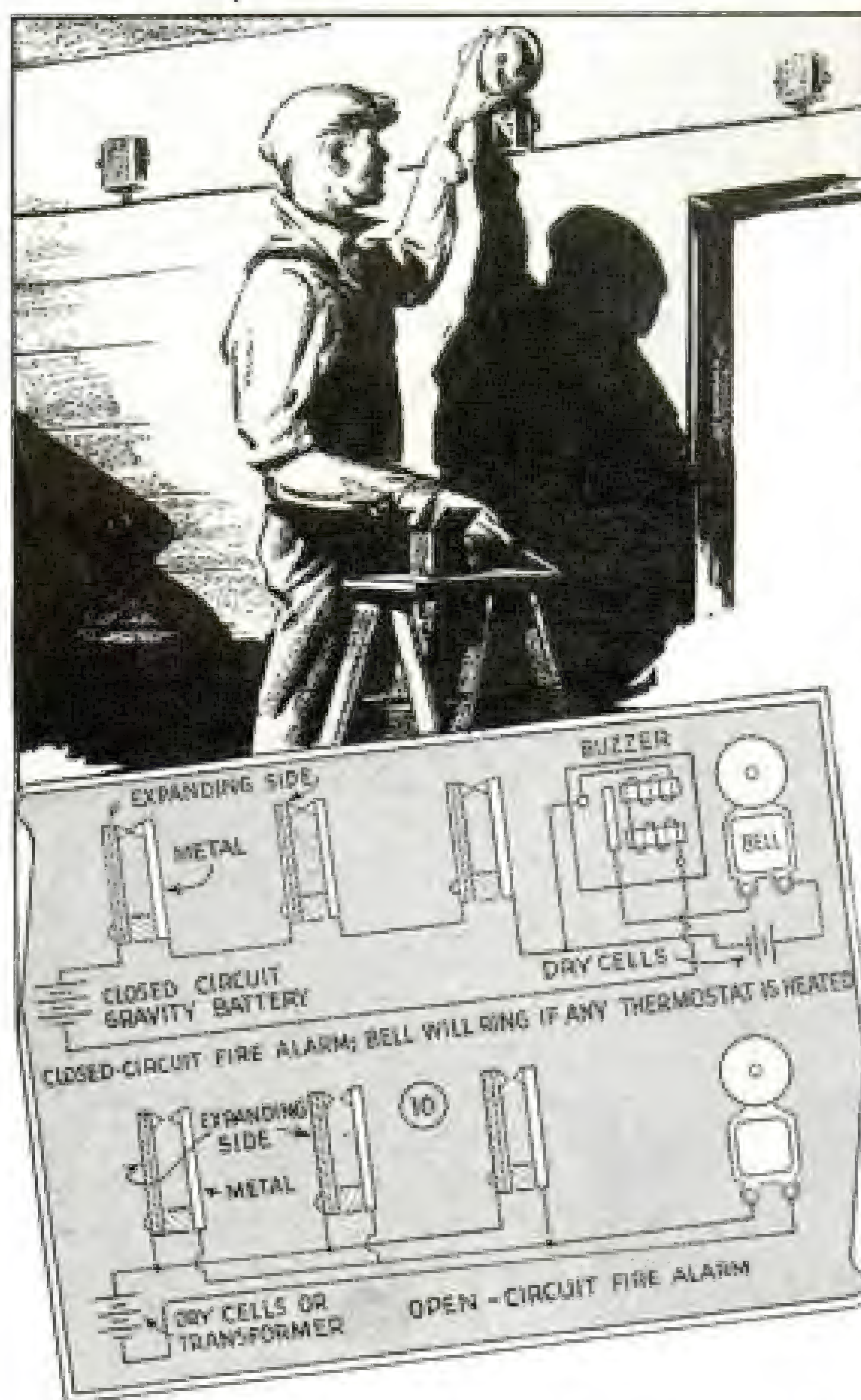
Fig. 8 and the upper detail of Fig. 9 show two types of flashers using bimetal thermo elements and Nichrome wire. The second diagram of Fig. 9 illustrates how to make a simple power cut-off thermostat for electric-heating appliances while the third detail gives a thermo relay for remote control, and the last one an application of a permanent magnet to produce snap action in a thermostat

formula, Fig. 5, we find that the design number for a thermostat to do this job is calculated by dividing  $D$  (the distance which the metal must move) by  $T$  (the temperature change which must cause this movement). Thus, dividing .04 by 8, we get .005 as the design number. Next, we will turn to the chart, Fig. 5, and find this number, .005, at the top of the chart. Following the .005 line up to the curve and then the coinciding horizontal line to the left, we find that the thermostat should be 5 in. long, that is the distance from the point at which contact is made to the point of mounting. It will be necessary to use a strip somewhat longer so as to have enough metal for mounting the unit on a wood or insulating base and for the riveting of contacts.

A thermostat of this type will not need to carry an appreciable load; therefore, it will be unnecessary to calculate the pull. We can simply use good design judgment and make the strip  $\frac{1}{2}$  in. wide and depend upon it to work satisfactorily. If the strip were 10 in. long it should be about  $\frac{3}{4}$  in. wide to produce ample rigidity. Accordingly, we can cut a strip of D-metal  $\frac{1}{2}$  in. wide and 6 in. long. The method of mounting the strip can be worked out to suit any particular case. The important thing is that the strip be mounted rigidly upon a base and that the fixed contact points be rigidly fixed so that they cannot vibrate or move. After the thermo element has been set up as shown and connected to light bulbs for test purposes, as in Fig. 7, the contact points should be so adjusted that the element will close on A when the



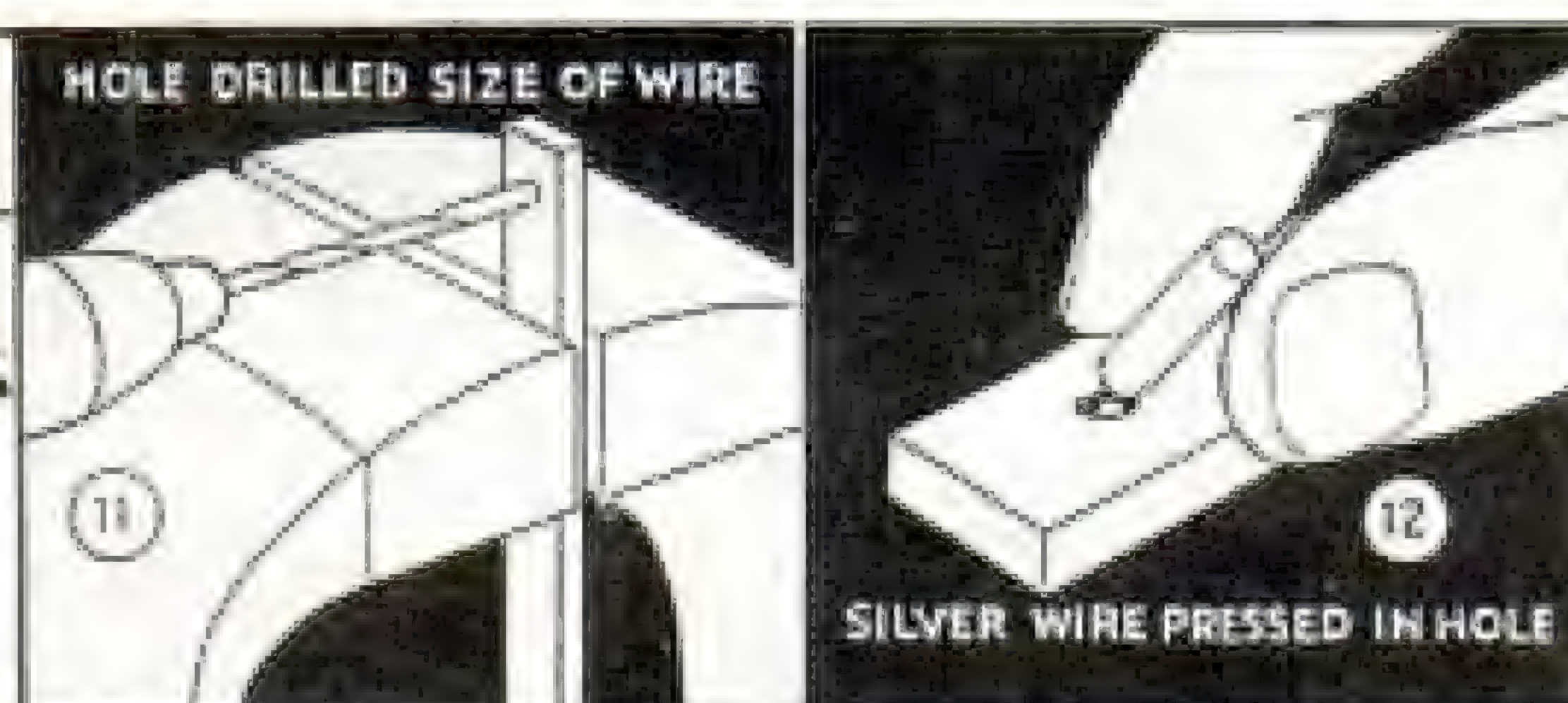




Here are two fire-alarm circuits in which use is made of thermostatic metal at the contacts. In the closed-circuit type, an interruption of current causes the bell to ring, while in the open-circuit type the making of a contact produces the same result

temperature is  $76^{\circ}\text{F}$ . It should then be allowed to cool and the contact point at B should be adjusted so that it closes on the other side when the temperature reaches  $68^{\circ}\text{F}$ . In some cases, thermostatic elements do not work very accurately when first made and may possibly require aging, by alternately heating and cooling 25 or 30 times. After this treatment, the units will usually work accurately. Heating and cooling are effected by placing the unit in an oven to heat and removing it to cool. If it is necessary to figure the pull of a strip unit refer to Fig. 6 for the formula.

**Designing U-Shaped Thermostats:** U-shaped thermostats give just half the movement that would be produced by a straight thermostat using the same total length of metal. Their ability to move a load is twice as great. To illustrate the



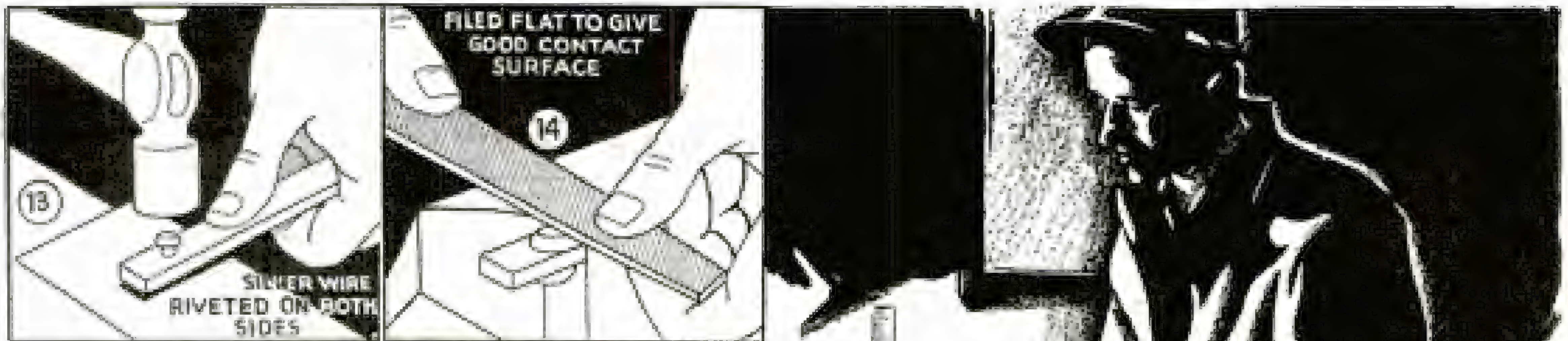
Figs. 11 to 14 picture the steps of fitting a silver pin in a strip of thermostatic metal to provide good mechanical and electrical contact

methods used in designing U-shaped thermostats, let us assume that we wish to build a thermostat like the one shown in Fig. 15. The thermostat is to be designed in such a manner that the U will bend upwards to lift a weight of .2 lb. .1 in. The weight may be a spring or other load which the unit must move when heated. Let us also assume that we want this weight to be lifted this distance when the temperature changes from  $80^{\circ}\text{F}$ . to  $90^{\circ}\text{F}$ . Subtracting 80 from 90 gives us  $10^{\circ}$  as the temperature change. Referring to the formula for U-shaped thermostats, Fig. 5, the design number is found by multiplying the distance to be moved by 2 and then dividing this result by the temperature change. Performing this, we get 2 times .1 or .2 in. Dividing .2 by 10 we get .02

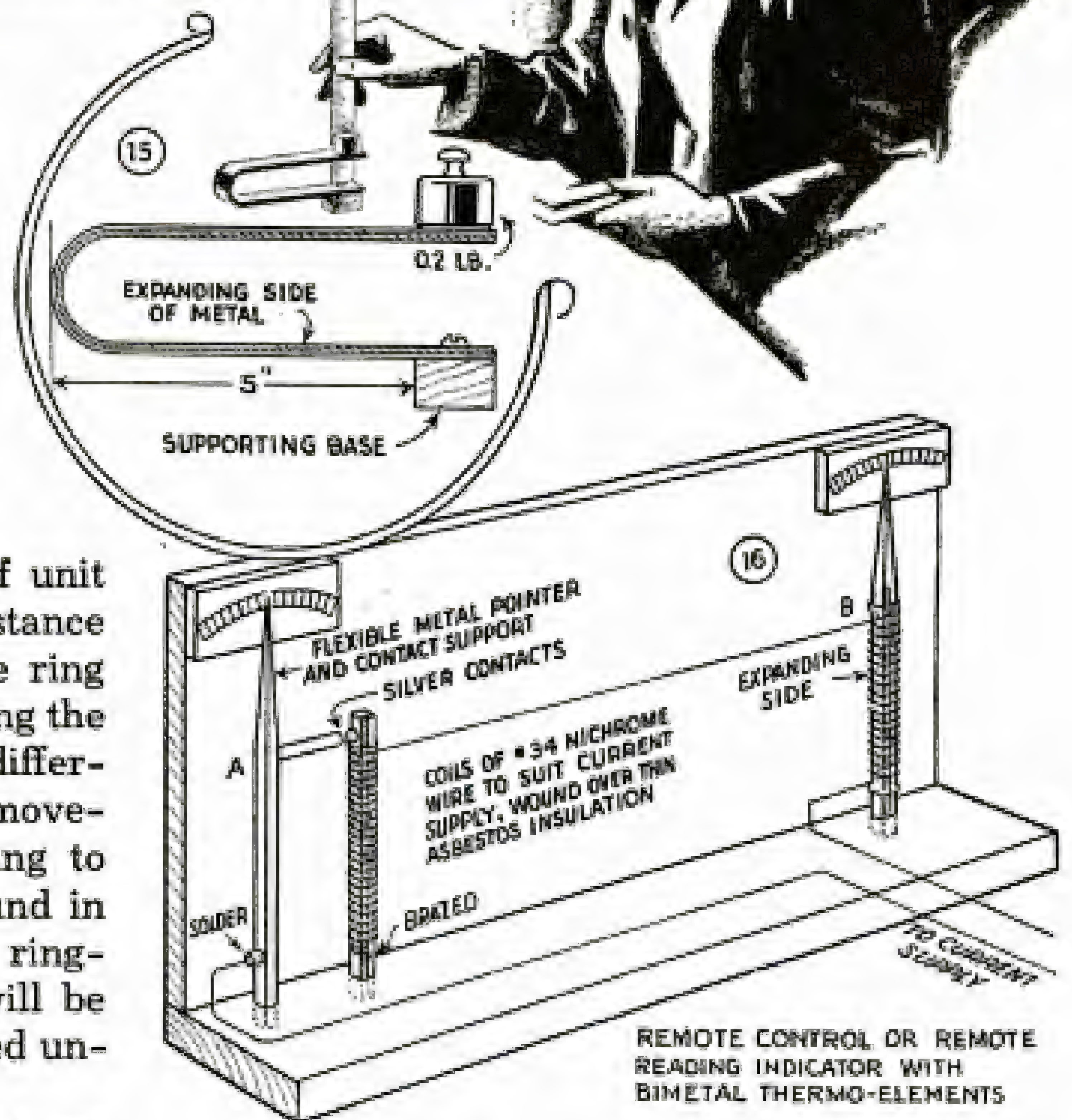
as our design number. Referring to the design chart, Fig. 5, we find that the total length of metal required will be 10 in. Next, we will figure the width of metal required. Referring to Fig. 6, we find that the width of strip needed equals 6 times R times the pull, divided by S, a value which will be found in the table. R is the bending length, which must support or lift the weight. Referring to Fig. 15, we see that the weight is to be applied at one end of the U; therefore R will be 5 in. Multiplying R or 5 times 6 times .2 lb., we get 6. If the thermostat is to be operated at a temperature of  $300^{\circ}\text{F}$ ., the table in Fig. 6 tells us that S or the number we must divide into 6 to get the width of strip required is 22.5. Dividing 6 by 22.5 we get .266 in. as the minimum width of strip which can be used to give the desired pull. To make the width in even numbers we can cut it to  $\frac{5}{16}$  or  $\frac{1}{2}$  in. and be safe.

**Ring-Type, Spiral and Helical Thermostats:** Ring-type thermostats are designed by following the formula in Fig. 5. The





The method shown in Fig. 15 is used to measure the movement of a U-shaped thermostat under a weight equivalent to the load it is to move. When this is done the thermostat must be brought from minimum to maximum temperature as in actual operation condition—usually by means of a resistance-wire winding illustrated in other diagrams. The principle involved in making a remote-control or remote-reading indicator with bimetal thermo elements, is shown in Fig. 16



design number for this type of unit is found by multiplying the distance through which the end of the ring must move by three and dividing the answer by the temperature difference which must cause the movement. The length corresponding to this design number can be found in the chart. The pull which the ring-type thermostat will deliver will be found by the methods explained under U-shaped thermo units.

Spiral and helical thermostats are used when a small change in temperature must cause rotary motion. See Fig. 4. With any given length of thermo metal wound in either spiral or helical form, the amount of angular movement will be exactly the same. To find the length of metal needed for these thermostats first determine the number of degrees of movement shown as R in Fig. 4. A protractor will be found convenient. The length of metal required is found by multiplying the number of degrees of rotary motion by .0004 and dividing this answer by the temperature difference.

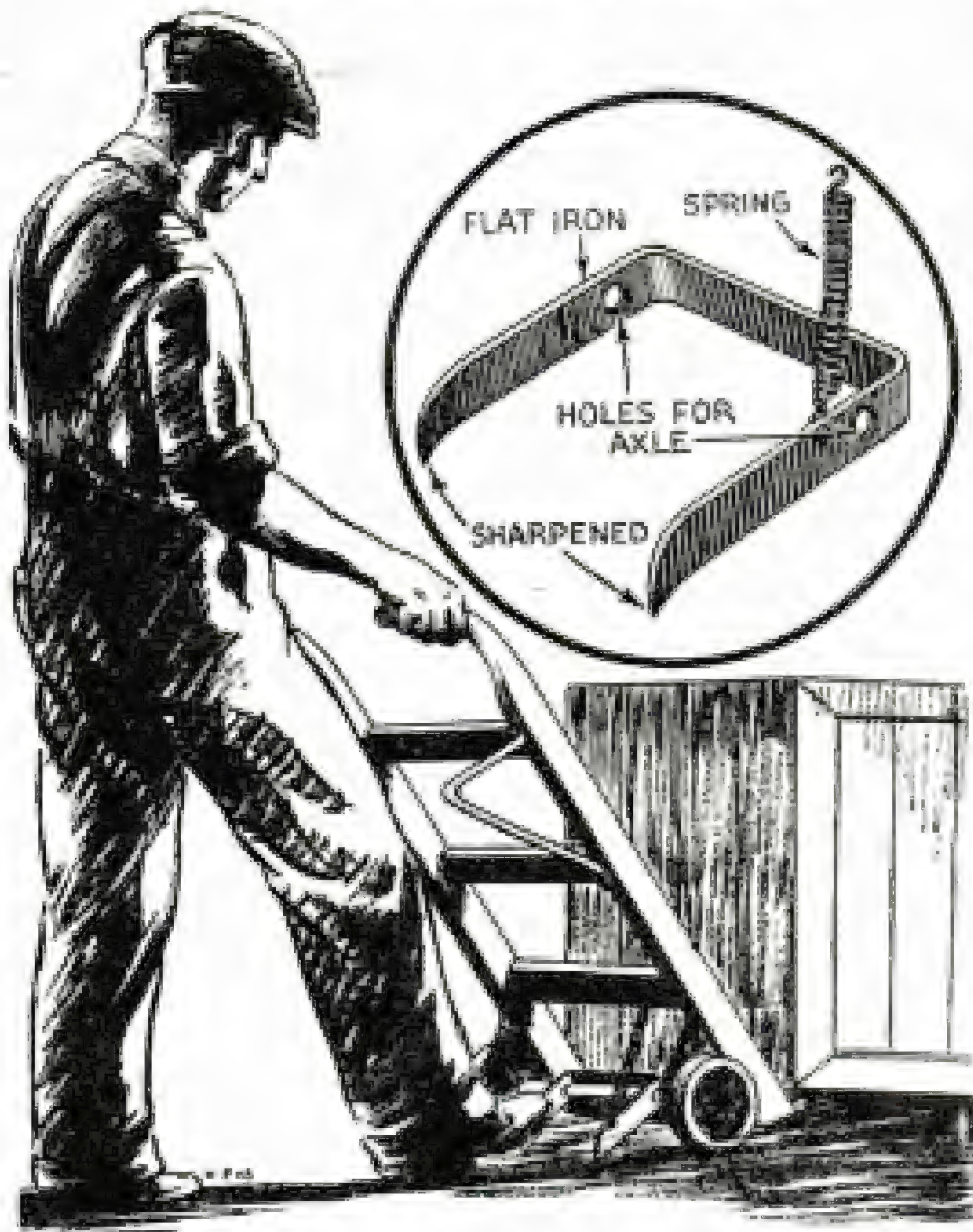
**Electrical Contacts:** Thermostats should be fitted with contact points which will carry electricity without arcing. These may be purchased ready made or you can make them from silver wire. Figs. 11 to 14 show a method of using silver wire for contacts. Silver wire in various sizes is available from any jeweler.

**Special Types of Thermostats:** Figs. 8, 9, 10 and 16 show a number of uses for thermostats. In all cases the length and width of metal required may be figured as explained. Nichrome wire is used to wind heating coils for many thermostats. The bimetal element should be covered with thin asbestos paper and the wire wound over this to prevent short-circuiting. Thermostat coils connected in series like the one in Fig. 8 should be wound with No. 22 or No. 26 Nichrome wire. For heavy loads use No. 22 wire. The amount of wire used is best determined by experimenting until the proper speed of operation is produced. Thermo units connected like the upper one of Fig. 9 should be wound with a heating coil of either No. 30 or 34 Nichrome wire. In this case the exact length will depend upon the voltage and speed of operation required and is best determined by experiment.

*Riverside Metal Co  
Reading Along Rd  
Riverside*



## Brake Holds Hand Truck Steady to Load Heavy Crates



*Brake bites into floor and prevents wheels from rolling back when load is tipped onto truck*

Bent as shown and pointed at the ends, a length of flat iron will make a good brake on a hand truck which is used for moving heavy crates and boxes, as it can be pressed down against the floor when the beak of the truck is forced under the load. A coil spring pulls up the brake when not in use. If the spring is unhooked and the brake is allowed to drag, it is useful when pushing heavy loads up an inclined platform or gangplank as it prevents the truck from slipping back.

## Slotted Gripper on Printing Press Is Removed Quickly

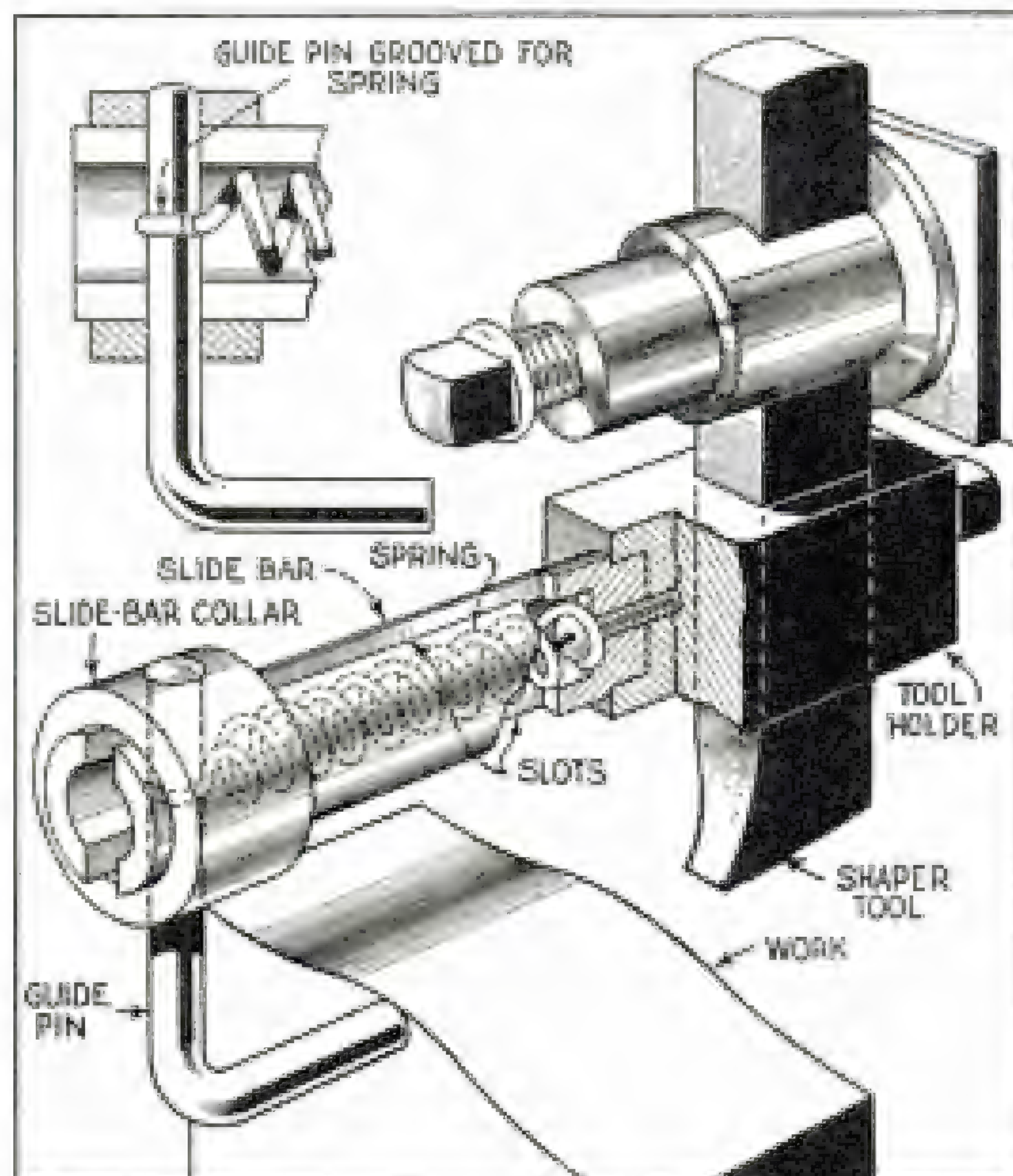


On printing presses having grippers of the type shown, which slip over square bolts on the gripper bar, much time can be saved when removing the grippers from the bar if one of their ends is slot-

ted. This permits the grippers to be removed or put on by loosening the nuts, making it unnecessary to entirely unscrew them.—T. R. Rice, Walla Walla, Wash.

## Tool Guide for Profile Shaping

Particularly useful when shaping irregular work, this tool guide does not move in relation to the backward and forward motion of the tool, therefore the position of the tool with regard to the layoff lines can be seen at all times. The guide consists of a tool collar, slotted slide bar and an extension spring. The collar slips over the end of the bar and carries a guide pin, which is attached to one end of the spring and works in the slot. The other end of the spring is held under the head of a large machine screw, which attaches the slide bar to a tool holder. This is clamped to the shaper tool with a set screw. In use, the assembly is adjusted up or down on the shaper tool until the latter just



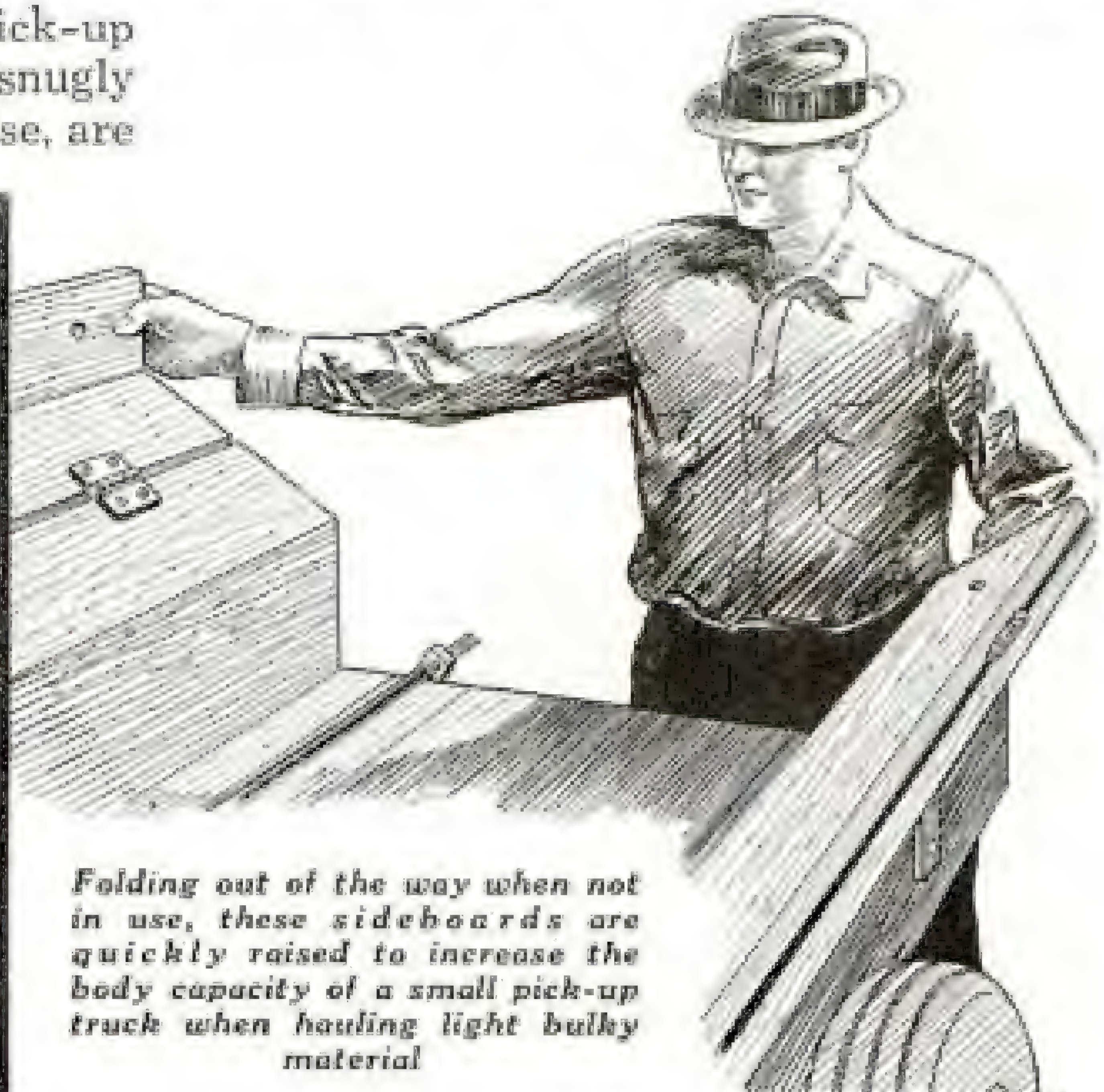
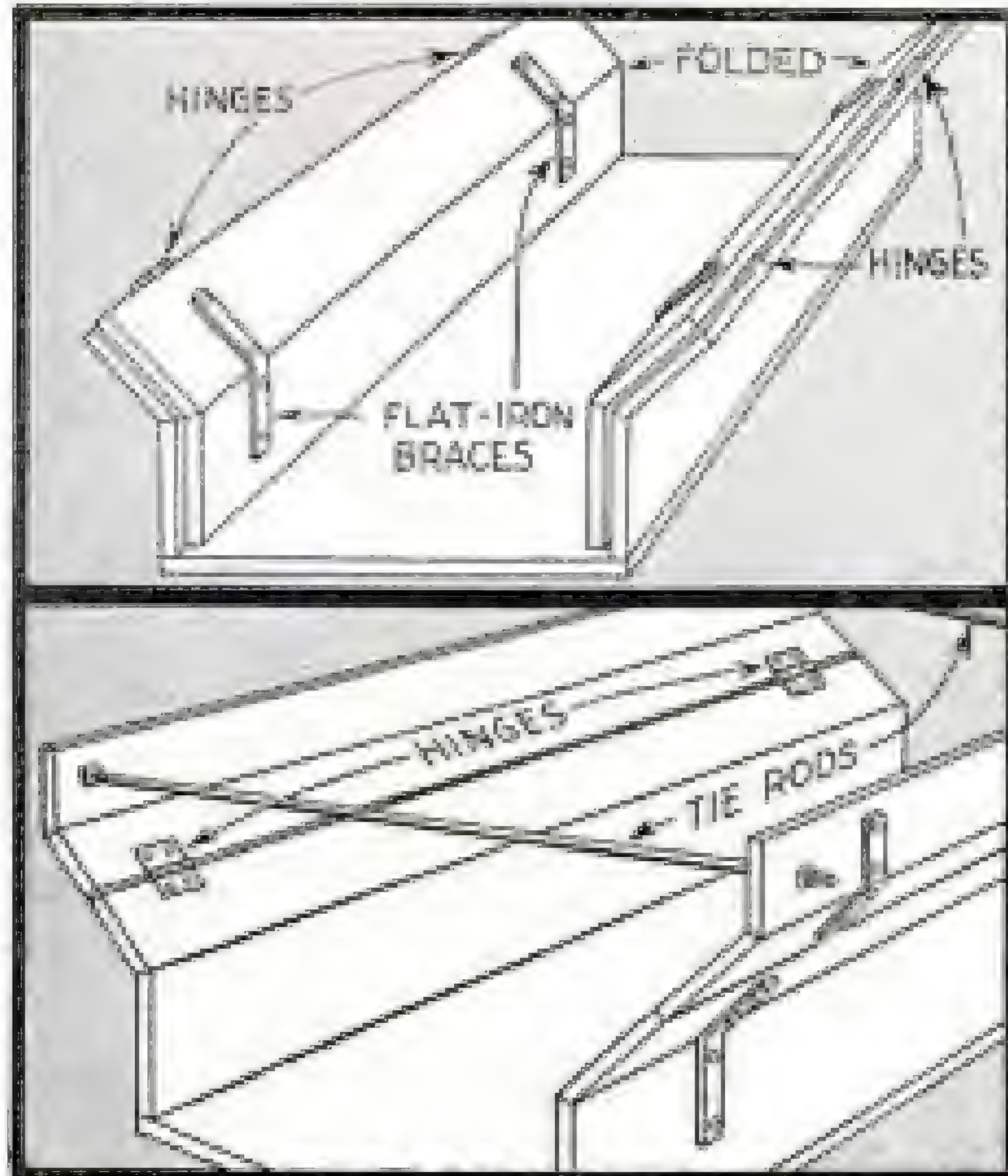
*Pointer remains stationary against side of work, making it easy to follow the guide line*

clears the guide pin. Then the table and tool post of the machine are moved in the usual way, but no notice is taken of the position of the shaper tool, the operator's attention being directed solely to the guide pin by which the tool adjustment is gauged.



## Folding Sideboards on Truck for Bulky Loads

Hinged to the flared sides of a pick-up truck, these sideboards, which fold snugly inside the truck body when not in use, are



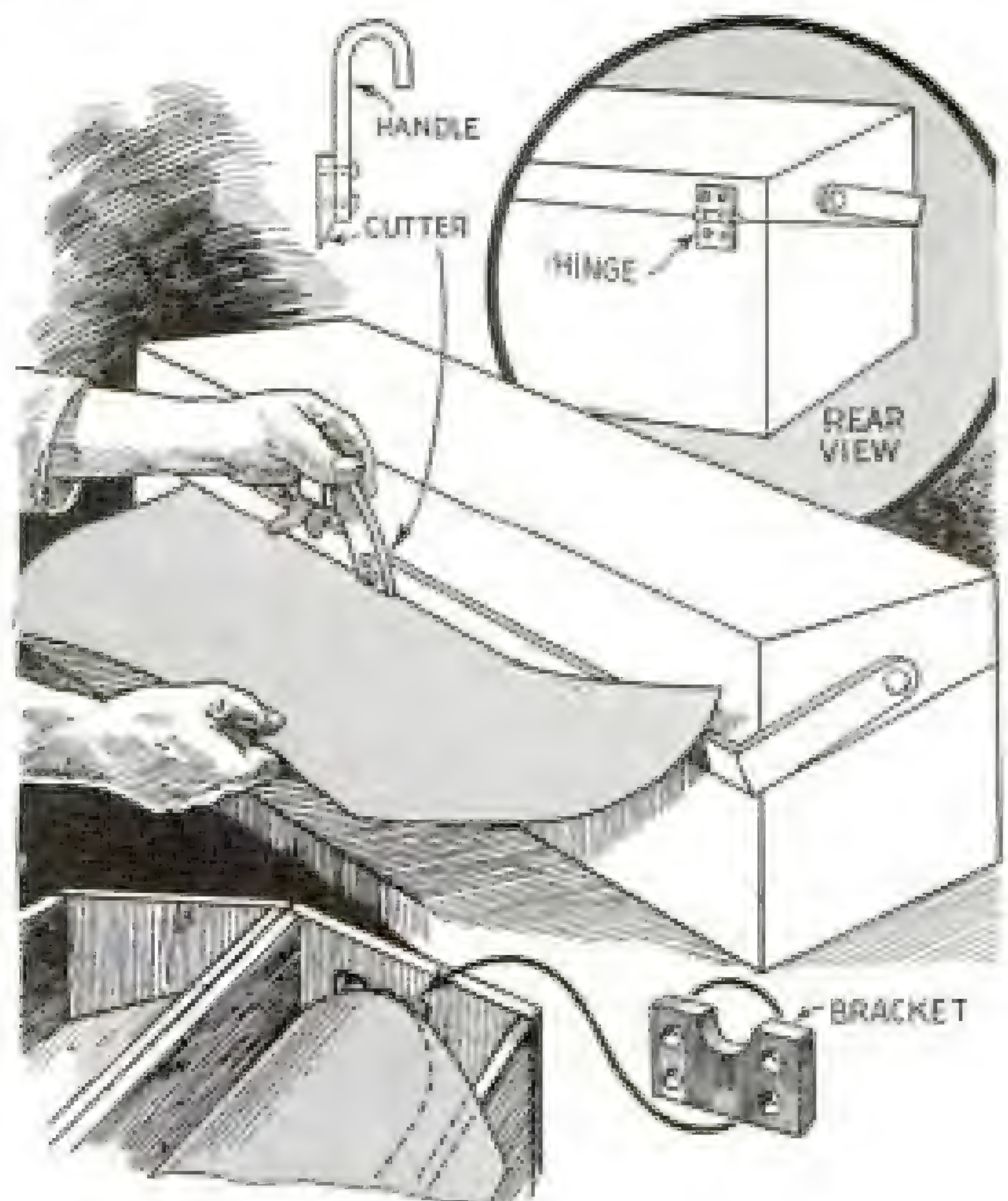
quickly brought into service for hauling light, bulky loads. Each sideboard consists of two pieces of hardwood joined at an angle with flat-iron braces, the angle being the same as that of the body side members. For a neat job, the abutting edges

should be beveled. The built-up sideboards are then hinged to the sides of the body with heavy butt hinges. Two  $\frac{3}{8}$ -in. iron tie rods threaded at each end and provided with double nuts, support the sideboards when open.

## No Waste of Blueprint Paper with This Box and Cutter

Any amount of blueprint paper can be drawn from this box and cut off squarely and to exact length required without waste of paper or loss of time, while the roll is always kept in the dark. Both the lid and top of the box are cut off at corresponding angles as shown, and the lid is hinged at the back. For a cutter, a piece of flat iron bent at right angles, as indicated, is pivoted to the ends of the lid so that the lower edge will strike the side about  $\frac{1}{4}$  in. below the bottom of the lid. The cutter is ground to a sharp edge. With this arrangement the paper always projects from the box about  $\frac{1}{4}$  in., so that it can be pulled out easily. The roll of paper, of course, is swung between two brackets screwed to the ends of the box on the inside.

Ⓒ Rubbed against aluminum, a pine stick leaves a black mark when the metal is heated to proper annealing temperature.





## Oil Cans Used for Containers Have Pipe Finger Grips



*Pieces of pipe slit along one side and hammered over edges of cans, serve as finger grips*

When discarded oil cans are used around a shop or farm as containers, short pieces of  $\frac{3}{4}$ -in. pipe fitted over opposite edges of the cans make good finger grips to carry them. The pipes are slit lengthwise along one side with a hack saw, after which they are slipped in place and hammered to close the slits tightly against the metal.

## Rubber Stamps Cleaned Easily with a Bottle Brush



When cleaning rubber stamps apply the cleaning fluid with a small bottle or percolator brush, rubbing the bristles back and forth across the letters. The bristles of these brushes are so soft that they will not mar the rubber, yet stiff enough to reach into the recesses of even a small stamp.

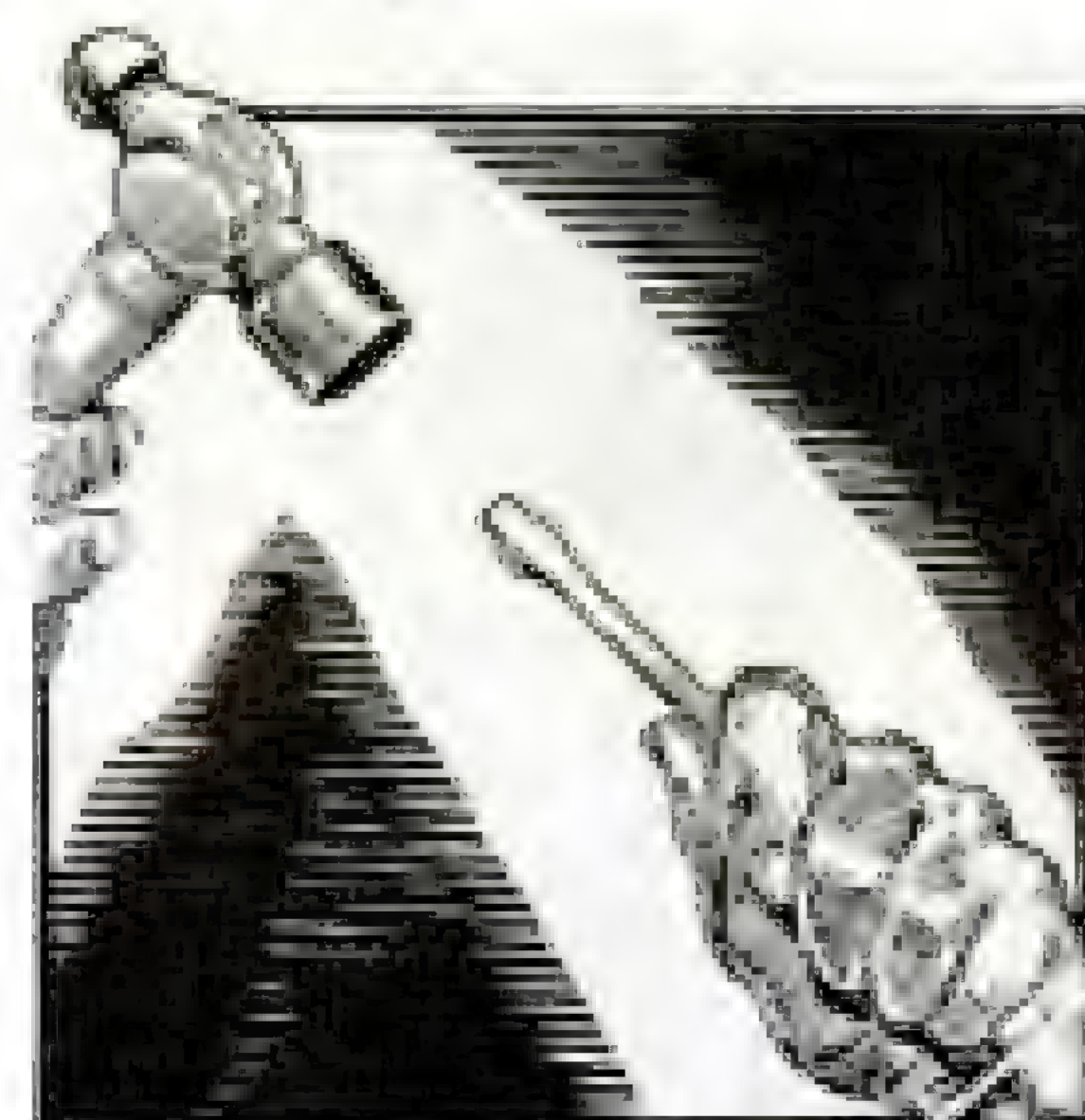
## Durable Crucibles for Casting

Recommended by a silversmith who for many years used it in making his own crucibles, the following fireproof composition is inexpensive and no parting oil is

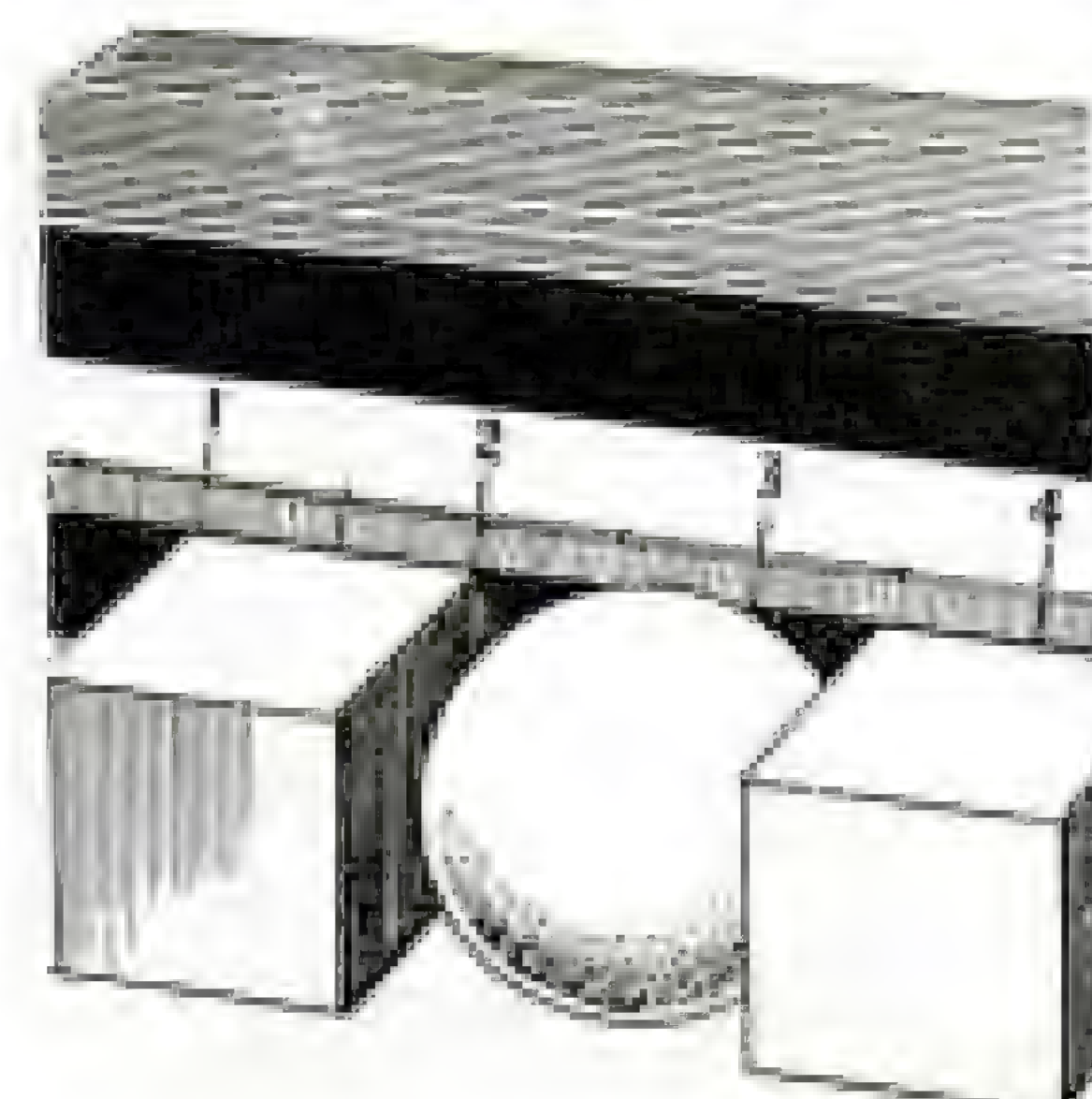
needed between the mold and casting. To make the composition, mix portland cement, 10 parts, plaster of paris, 4 parts, fire clay, 3 parts, and asbestos powder, 1 part, with enough water to make a thick mass. For an extremely hard casting, bake the mixture in a hot oven.

## Burring End of Screwdriver Gives It Grip

If a screwdriver has a tendency to twist out of the slot in a screw head, give the end of the blade a few taps with a hammer to burr it slightly. The sharp edges of the burr will bite into the sides of the screw slot.



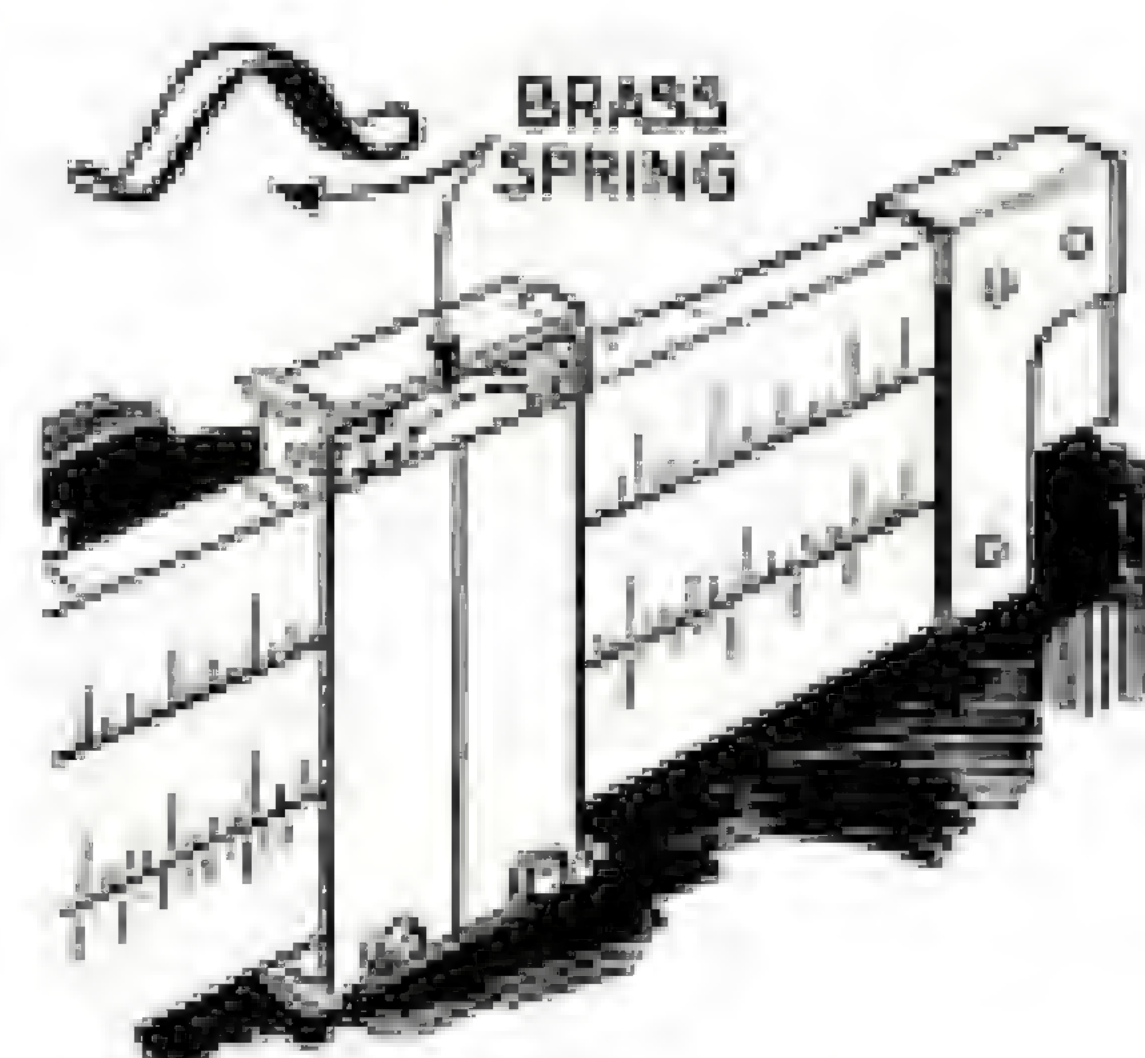
## Measuring Diameter of Balls



It's very simple to find the diameter of a ball or other spherical object, by placing it between two blocks and measuring across the top of them with a scale. If very accurate measurements are necessary, the blocks should be absolutely square.

## Brass Spring on Slide Rule to Avoid Rust Spots

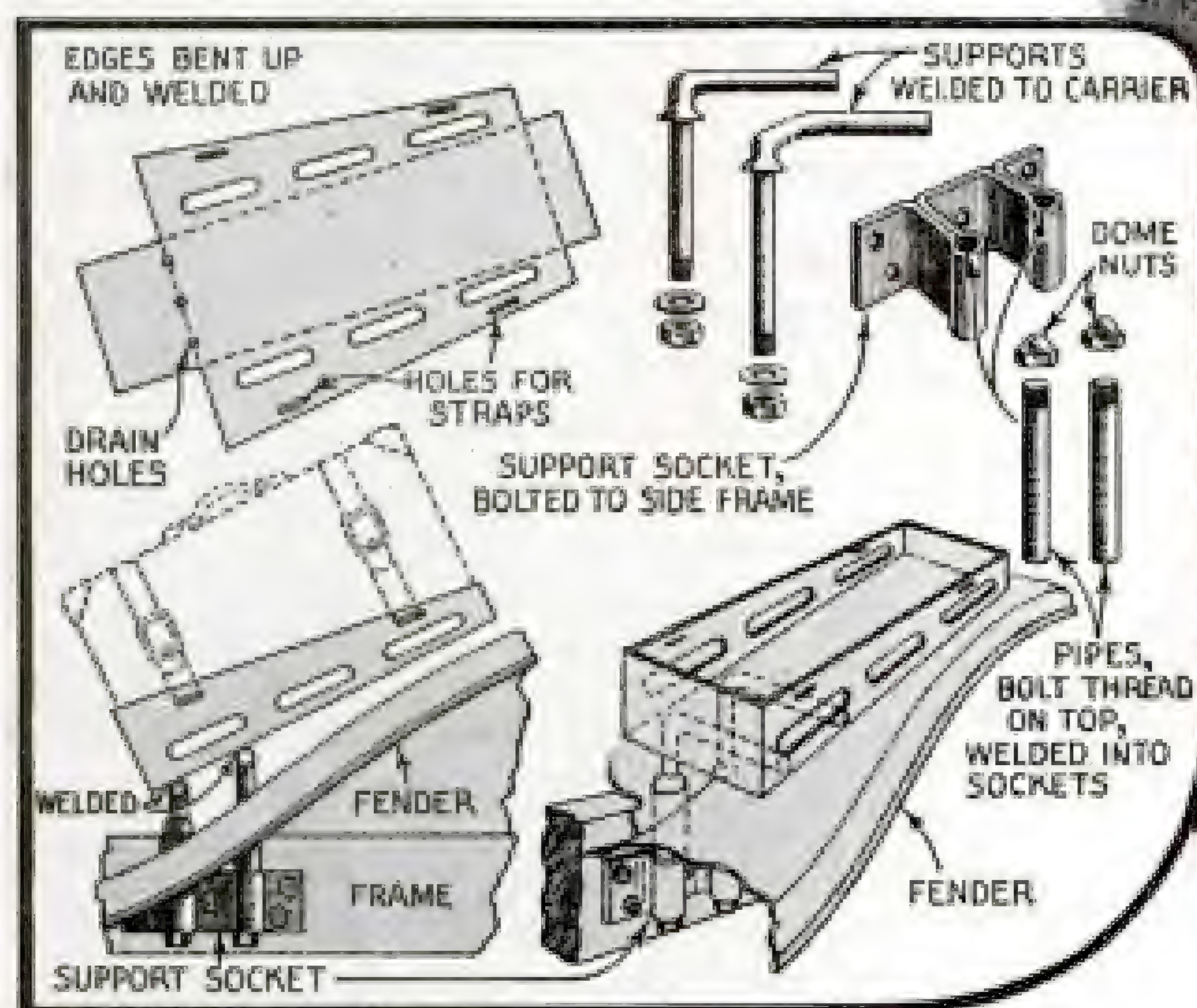
To eliminate spots and streaks on the edge of a slide rule that are caused by rust from the steel spring on the indicator, remove the spring and replace it with one of spring brass. As a further protection, clean the brass thoroughly and dip it in clear metal lacquer to help avoid corrosion.





## This Sheet-Metal Luggage Rack Is Removable

Slipped into place quickly, this luggage rack is located over the front fender where it cannot mar the car finish and will not interfere with opening the door. It is



*Here's a carrier for that extra suitcase. There's nothing to rattle and no part of carrier or luggage can touch the car finish*

mounted on a bracket bolted to the car frame under the front fender. The sheet-metal carrier is held about an inch above the fender by a pair of iron brackets welded to the bottom. These are L-shaped, flanged to fit into sockets welded to the

bracket, and the lower ends are threaded for nuts and lock washers. Upper ends of the pipe sockets are threaded for chrome-plated dome nuts. The carrier is made of  $\frac{3}{32}$ -in. sheet iron, cut to the pattern shown, slotted, and then welded at the corners.

## Fenders Shielded Against Flying Stones on Gravel Roads



Motorists who drive on graveled roads often find that their fenders are dented by small stones thrown against them by the tires. These dents not only mar the appearance of the car but are starting points for rust. To avoid this trouble, some owners cement strips of composition roofing to the undersides of the fenders. To do this, rubber cement is used, two coats being applied to both the fenders and strips, allowing the first coat to dry before applying the next. When the last coat is dry, the roofing strips, which should be about 6 in. wide, are pressed firmly in place.—C. E. Packer, Chicago.

¶ For cementing abrasive paper to sanding disks, melt together tallow, 3 oz., and rosin, 1 oz., casting the mixture into sticks, which are then held against the rotating disk until it is well coated.



## Snowdrift Against Garage Doors Pulled Away on Carpet



*It takes only a moment to clear away a heavy blanket of snow so that garage doors will open freely*

Physicians and others who must have their autos ready for instant use, need not spend valuable minutes in shoveling the snow away from the garage doors if a burlap carpet is left spread upon the driveway. The burlap should be hemmed at the ends for insertion of stout poles to which pull ropes are attached for rolling back the carpet. If a thin layer of sand is sprinkled over the driveway before the carpet is spread, there will be no danger of the burlap freezing to the concrete, and it may be left in place all winter.

## Emergency Pump Diaphragm Improvised from Celluloid



If the diaphragm in a fuel pump breaks on the road, an emergency repair to get to a garage can be made from a piece of photo film. When this happened to my car, I

removed the diaphragm and used it as a pattern to cut the film, after which both

pieces were put in the pump. Then the pump casting was replaced and holes were punched in the film, the repair being completed by bolting the assembly together. After driving the car 25 miles to a garage, the improvised diaphragm was still "going strong."—J. R. Flaherty, Springfield Gardens, Long Island, N. Y.

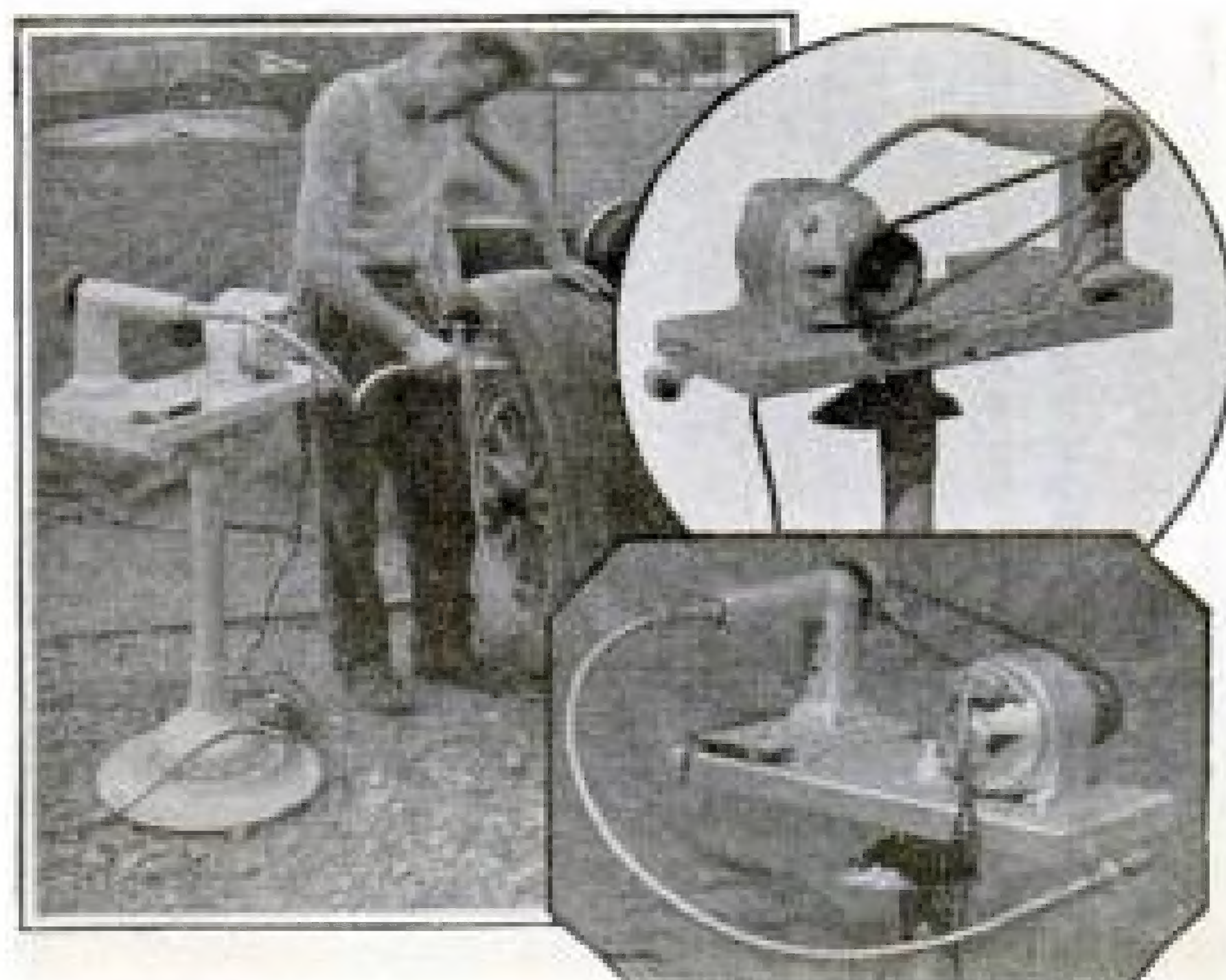
## Center-Punching Name on Tools

You can initial your tools neatly and quickly by first typing the letters on a slip of paper, which then serves as a pattern in center-punching the letters on the tools, using rubber cement to stick the paper in place. Punch uniformly at close intervals over each type-written letter. This will go through the paper into the steel, giving a neat and legible impression.



## Portable Drill for Small Shop Has Flexible Shaft

Improvised from scrap parts, this electric drill was made by a mechanic for use in various parts of the shop as well as for making minor repairs to cars at the curb. The drill consists of an electric motor, sewing-machine head and a flexible shaft, which are mounted on a short plank. This



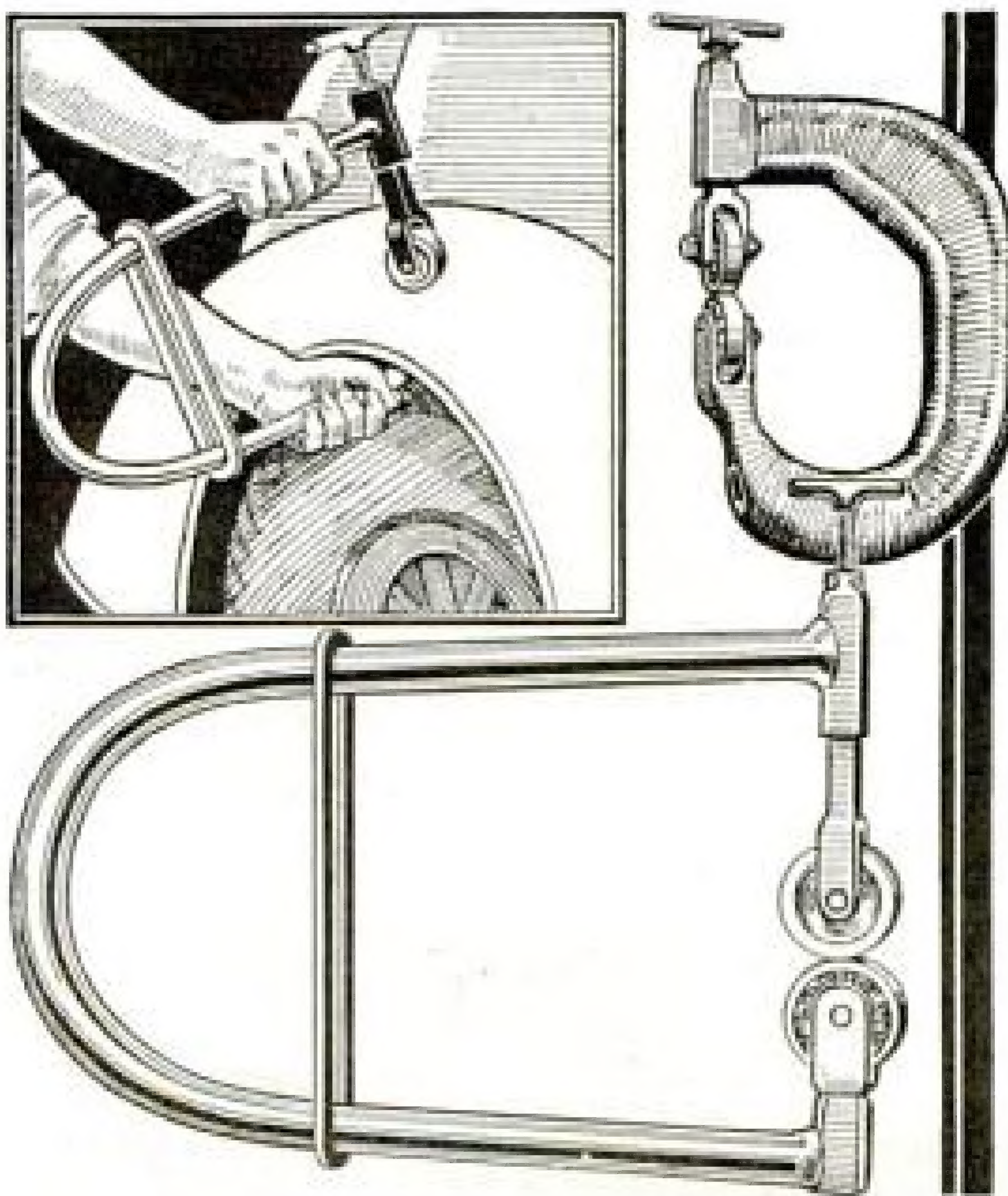
*Base of the drill is any piece of metal heavy enough to keep the unit from upsetting*



pivots on a standard, which is one half of an old rear-axle assembly, the plank being drilled to slip over the projecting end of the axle where it is held with the axle nut. Both the sewing-machine head and the motor are fitted with step pulleys, the flexible shaft being fastened to the outer end of the sewing-machine shaft.—Edward Lindberg, Sherman, N. Y.

### Tools for Rolling Out Fenders Made from Old Bearings

Any mechanic can make a set of tools to roll out crumpled fenders by using old ball bearings, which are fastened to C-frames. These may be any size needed and are made of heavy iron or tubing as shown. One bearing is held in a forked piece welded to the lower end of the frame, while a second bearing is mounted on a square, forked pin, which moves in a socket welded to the upper end of the



*Upper bearing assemblies move in square sleeves and are adjusted with thumbscrews*

frame. A large thumbscrew at the top of the socket regulates the adjustment. On tools having a large throat, a sliding brace of square iron rod helps to hold the adjustment.—Jos. C. Coyle, Phoenix, Ariz.

¶Film cement, when applied sparingly, can be used as an adhesive for Cellophane.

### Lubricating Wedge for Springs Gets Oil Between Leaves

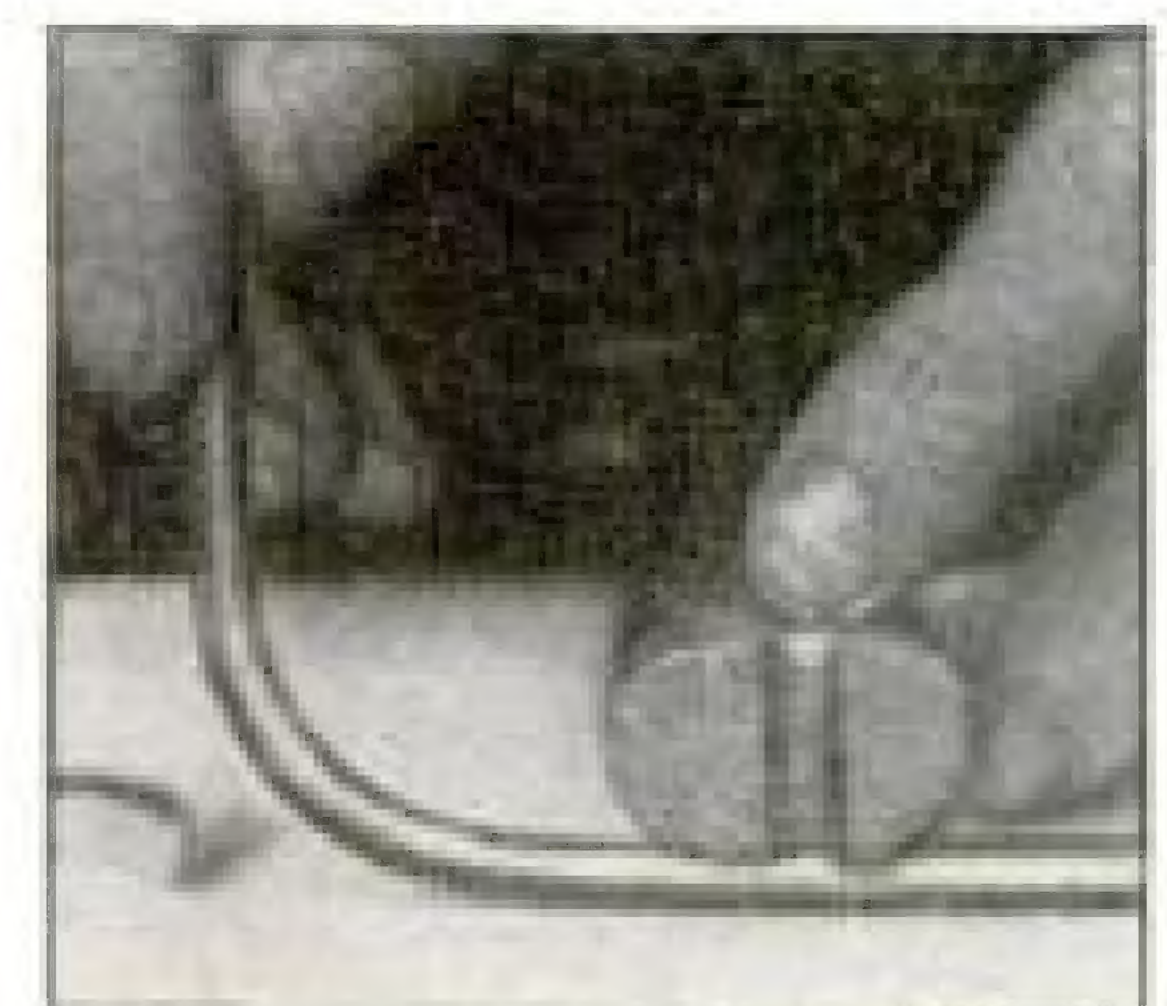


*Slot in wedge is beveled at rear end to carry oil between the spring leaves*

To lubricate auto springs with the assurance that the oil will be well distributed between the leaves, use a leaf spreader similar to the one shown, which has a slot in one end to allow the oil to flow to all parts of the leaves. The spreader is simply a piece of steel ground to a wedge shape at one end and then slotted, the rear end of the slot being beveled to carry the oil from the can spout in between the spring leaves.—Lester P. Young, Culver, Ind.

### Copper Tubing Bent at Angles by Grooved Hammer Handle

If you have occasion to make sharp bends in small size copper or brass tubing, away from the bench where tools for such jobs are kept, a simple



dodge in bending without kinks is to make use of a hammer handle in which a groove has been cut as shown. The combined action of pressing the handle firmly against the inside radius of the tubing, which fits in the groove, and gradually bending the tubing, does the trick. In this way, the tubing is slightly flattened which facilitates making the bend.



## Ham Is Supported Vertically for Easy Slicing



*You'll be surprised how uniformly a ham can be sliced when it is supported rigidly*

In restaurants, lunchrooms and other places where many hams are used, the job of slicing can be simplified greatly by supporting them rigidly in a vertical position on the shank end. A good support for this purpose is made by driving a large spike through the center of a piece sawed from the end of a large plank. If the shank end of the ham bone is sawed off to expose the marrow, the spike can be inserted into this as shown.

## Metal Drilling Chips Removed by Compressed Air

When it is difficult to remove drill chips, once they get inside of work such as tanks, manifolds, crankcases, etc., you can prevent the entrance of such chips by building up the internal pressure with a connection to the compressed-air line. Of course, the interior must be airtight, all holes being plugged, and the pressure should be about 1 lb. per sq. in. When the drill breaks through the wall, chips are blown outward.

# The Next Issue

## IDEAS IN DESIGNING YOUR SOAP BOX RACER

Chock full of suggestions that will help you in designing your own car for the biggest American race. First of a series of articles showing advantages and disadvantages of various types of frames, brakes, steering mechanism, etc. Tells how to assemble the parts rigidly and neatly, using either wood or steel.

## PHOTO ENLARGER FOR FIVE DOLLARS

Six lamps assure uniform illumination of the entire negative area in this enlarger, which is constructed from scrap parts and utilizes your camera lens.

## VANITY MIRROR OF MODERN DESIGN

Combining mahogany and brass tubing in a simplified construction that produces a smart effect in table mirrors. For use on a vanity or hallway table.

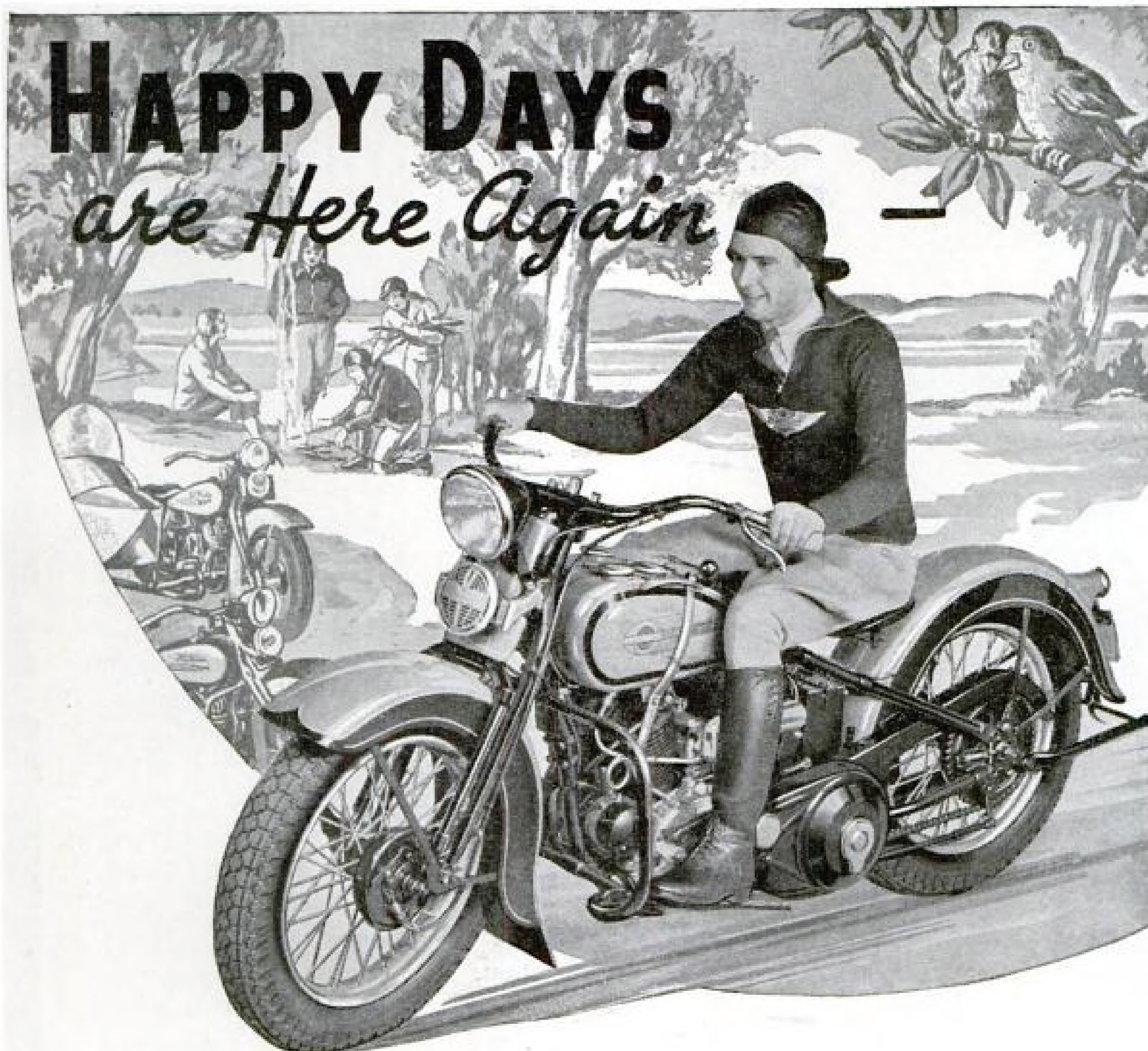
## ELECTROPLATING WITH ALLOYS

Thoroughly describes every step of this interesting process so you can successfully plate with brass, bronze and cadmium-silver alloys on a small scale.

## UTILITY SEWING CABINET

Consisting merely of a box mounted on two turned legs, this sewing cabinet is fitted with sliding trays to keep sewing accessories neatly at hand.





**S**PRINGTIME is get-together-time — out of doors! You enjoy old friends more — make new friends — and pack every outdoor hour with pleasure — when you own a 1936 Harley-Davidson. . . It's some motorcycle! You'll marvel at its wind-piercing lines and perfect balance — its airplane-like speed and snap — and above all, the amazing performance of its up-to-the-minute motor with new and exclusive features. Many sparkling color combinations — every one a beauty. Streamlined sidecar or chummy "Buddy Seat" for get-together rides — available on the 45's, 74's and the new 80 cubic inch Twin.

See your nearest Harley-Davidson dealer—PRONTO! Ask him for a **FREE RIDE**—about his **EASY PAY PLANS** — and send in the coupon.

Ride a  
**HARLEY-DAVIDSON**

**MAIL THIS COUPON**  
HARLEY-DAVIDSON MOTOR CO.  
Dept. P. Milwaukee, Wis.

Send colorful folder illustrating and describing the 1936 models. Postage stamp is enclosed to cover cost of mailing.

Name \_\_\_\_\_

Address \_\_\_\_\_

My age is ☐ 16-19 years, ☐ 20-30 years,  
☐ 31 years and up, ☐ under 16 years. Check your age group.

When writing to advertisers please mention Popular Mechanics